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Research Article

Effects of Deep Sedation on Future Anxiety and Behavior in a Pediatric Dental Setting: A Prospective Report

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Abstract

The present prospective study was conducted to evaluate effects of intravenous deep sedation on future anxiety and behavior in pediatric dental patients. This trial enrolled 30 anxious and uncooperative 2-6 year old children undergoing dental treatment under intravenous deep sedation. The primary outcome measure was changes in Venham's anxiety score and Frankl behavior rating at 48 hour post-operative follow up. Results showed insignificant changes in these two parameters. Thus, deep sedation has got no effects on future anxiety and behavior profile of children.

Keywords: Anxiety, Behavior management, Deep sedation, Intravenous sedation, Pediatric dentistry, Propofol

Introduction

Pediatric dentistry is a challenging branch as in addition to mechanical skills of dental intervention, the psychological intellect is needed for behavior management. The behavior management techniques (BMTs) encompass a range of techniques from conservative non-pharmacotherapeutic BMTs to aversive BMTs and pharmacotherapeutic BMTs, i.e., sedation and general anesthesia [1]. The behavior management has shown a paradigm shift over the decades owing to contemporary overprotective parenting styles and currently there is no room for aversive BMTs [2-5]. In case of failure of conservative BMTs, the only way out to manage a difficult child is pharmacotherapeutic BMTs. Amongst the pharmacotherapeutic BMTs, sedation is preferred over general anesthesia owing to greater safety and lesser expenses. Additionally, further benefit of sedation over general anesthesia is long term positive effect on child's behavior and anxiety [6-8]. This additional benefit is yet debatable with no conclusive evidence being available in this regard [6-8]. There is scarcity of studies exploring the effect of sedation on future anxiety and behavior profile of children. Further, the previously published studies have evaluated future behavioral effects of either moderate sedation or general anesthesia and no study till date has explored the effect of deep sedation on future anxiety and behavior profile of children. While for children less than 6 years of age, deep sedation is preferable [9-11].

Keeping these facts in mind we planned a prospective clinical audit to evaluate changes in anxiety and behavior following dental treatment under deep sedation with propofol.

Material and Methods

Study design and settings

This prospective single arm clinical observation was conducted in Unit of Pediatric and Preventive Dentistry, Oral Health Sciences Center, PGIMER, Chandigarh, India. The study was approved by university's ethical committee and review board prior to its commencement.

Recruitment of subjects

The present study recruited 30 subjects aged 2-6 years visiting the outpatient department of our centre. The inclusion criteria were Venham's anxiety score [12] of ≥4, Negative/Definitely negative behavior as per Frankl behavior rating scale [13], ASA

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physical status I [14], indication for pulpectomy in at least one primary molar and adherence to NPO (nil per oral) guidelines [14]. The exclusion criteria were history of dental treatment and/or exposure to sedation/general anesthesia, mental retardation and/or learning disabilities, allergy to soya milk/eggs. In case of history of URTI (Upper respiratory tract infection), a symptom free time period of ≥4 weeks prior to scheduled date of sedation appointment was mandatory.

Interventions

All subjects were pre-medicated with oral midazolam 0.5 mg/kg (Mezolam® Neon, India; 2 mg/mL) twenty minutes prior to venous cannulation. Bolus of 1 mg/kg IV propofol (Diprivan® Astra Zeneca Pharmaceuticals; 10 mg/mL) mixed with 2% of 1 mL lignocaine followed by 25-75 µg/kg/min of propofol infusion was administered to achieve a target score of ≥4 for overall behavior as per Houpt's sedation rating score. In case of failure to achieve desired sedation level with this regimen, a provision was there to administer additional 1-1.5 mg/kg IV bolus/es of propofol along with 2% of 1 ml lignocaine.

Observation	Assigned score
Did the patient's movement during local anesthesia or the operative procedure interfere or delay the procedure?	
No interfering movements	0
Minor movements, positioning remained appropriate	1
Minor movements, patient had to be repositioned	2
Movements grossly interfered with the procedure	3
To what extent did the patient verbalize during the procedure?	
Not at all	0
Some verbalization, but did not indicate pain or discomfort	1
Some verbalization indicating pain or discomfort	2
Complained frequently during the procedure	3
Did the patient show non-verbal signs of discomfort during the procedure?	
Not at all	0
Slight discomfort, occasional grimaces	1
Moderate discomfort, feet/hands tensed, tears in eyes	2
Marked discomfort apparent during the procedure	3
Total score = 0-9; lower score indicating higher discomfort	

Table 1: Cooperation scale.

Outcome measures

The primary outcome measure in the present study was changes in the anxiety and behavior profile after a follow-up period of 48 hours compared to the anxiety and behavior profile at the time of recruitment in the study. The anxiety and behavior profile was evaluated using Venham's anxiety rating scale and Frankl behavior rating scale respectively. The anxiety and behavior profile was evaluated at three time points of observation, i.e., O1: at the time of recruitment in the study, O2: on the day of operative intervention and O3: at 48 hour post-operative follow-up. Secondary outcome measures were successful completion of procedure and cooperation profile during the procedure. The success of procedure was recorded on a three point scale, i.e., successfully completed without interruptions/completed with interruptions/incomplete. The cooperation profile was rated using parameters by Ustun et al. (Table 1) [15].

Statistical analysis

The entire set of data was recorded on pre-printed structured proformas. The statistical analysis was carried out using SPSS software (Version 22; IBM, Redmond, Washington, USA). Descriptive statistics were expressed as mean ± SD and/or number/percentage. Comparative statistics were calculated using Chi square test.

Results

Mean age of the subjects was 44.27 ± 15.98 months. Mean weight of the subjects was 13.87 ± 4.57 kgs. There were a total of 16 males and 14 females. No significant changes ($p>0.05$) were observed in anxiety and behavior scores were observed at any time point of observation, i.e., O2 and O3 compared to O1 (Tables 2 and 3). Mean total cooperation score was 2.64 ± 2.13 (Table 4). In none of the patients the procedure was abandoned incomplete. The procedure was successfully completed without interruptions

Time point of observation	Type of behavior displayed			
	Definitely negative	Negative	Positive	Definitely positive
O1: at the time of recruitment in the study	17	8	5	0
O2: on the day of operative intervention	15	10	5	0
O3: at 48 hours follow-up	13	10	6	1

Table 2: Distribution of children according to Frankl behavior scores at various time points of observation.

Time point of observation	Venham's anxiety score					
	0	1	2	3	4	5
O1: at the time of recruitment in the study	0	0	0	0	6	24
O2: on the day of operative intervention	0	0	0	0	7	23
O3: at 48 hours follow-up	0	0	0	1	10	19

Table 3: Distribution of children according to Venham's anxiety scores at various time points of observation.

Variable	Mean ± SD
Cooperation scores during administration of local anesthesia	1.36 ± 1.01
Verbal signs of discomfort during the procedure	0.71 ± 0.82
Non-verbal signs of discomfort during the procedure	0.57 ± 0.94
Total cooperation score	2.64 ± 2.13

Table 4: Cooperation profile during the procedure.

in 22/30 (73.3%) children and completed with interruptions in 8/30 (26.7%) children.

Discussion

The present study failed to show effects of deep sedation on postoperative behaviour and anxiety. A very small and insignificant decrease ($p > 0.05$) in anxiety levels was noted at 48 hours postoperative follow-up as per Venham's and Frankl rating scales. Previously few authors [6-8] have made an attempt to draw conclusions on whether there is any relationship between exposure to conscious sedation and changes in anxiety and behavior profile. These authors have reported conflicting findings. However, no study previously has evaluated changes in anxiety profile following exposure to deep sedation.

Koroluk et al. [6] conducted a study to investigate dental anxiety in adolescents with a history of childhood dental sedation with the purpose of ascertaining long term psychological effects of receiving dental treatment using sedation. A group of 287, 14-16 year olds with a history of conscious sedation were recorded for dental anxiety using modified dental anxiety scale (DAS). Control group consisted of randomly selected children matched for age and sex. Results showed that DAS scores for test subjects were (13.49 ± 0.76) significantly higher than the DAS scores for control subjects (10.84 ± 0.69).

Peretz et al. [7] conducted a study to evaluate behavior in follow up visits of children with baby bottle tooth decay (BBTD) treated under general anesthesia or sedation. Sample consisted of 65, 4-6 year olds of which 34 were treated under general anesthesia and 31 under conscious sedation. Time lapse between recall examination and treatment was similar between two groups i.e. 13.5 ± 5.2 mo for GA and 15 ± 6.0 for conscious sedation. Authors reported that children who had dental treatment under GA or sedation demonstrated similar behavior in routine follow up examination and a significant number of children who were described as negative initially became positive.

McComb et al. [8] investigated relationship between oral conscious sedation and subsequent behavior in dental setting. Thirty eight children between the ages of 39-71 months who were previously treated with oral and inhalation sedation 2-34 months prior to participation were taken up for study. Control group consisted of 38 children matched for age and sex who had undergone dental treatment 1 week to 3 years previously under routine behavior management techniques. Average rating for behavior was positive or very positive regardless of effectiveness of sedation and correlation coefficients were quite low, ranging from 0.16-0.26. This finding led author to conclude that oral sedation had no significant effect on future dental behavior at 2-34 months.

The results of above quoted studies do not lend to any conclusive interpretation on effect of sedation on future anxiety during follow up visit because of conflicting observations. In the present study, the postoperative anxiety and behavior evaluation was though done after a very shorter time lapse when compared to previous studies. It was done after a standardized time period of 48 hours. While in other studies no such standardization was there with a varied follow up period. Also, no reports on inter-appointment dental exposures were there in other studies. While in the present study, no dental exposure was there in between two recording appointments. Thus the results of our study should remain reliable.

One limitation of our study is absence of a valid control group which could have been conservative behavior management or general anesthesia. The explanation to this methodological flaw lies with recruitment arm of this study. One mandatory inclusion criteria was Venham's anxiety score ≥ 4 and definitely negative/negative behavior as per Frankl behavior rating scale. Children with this anxiety and behavior profile cannot be treated with conservative behavior management techniques and this ruled out the possibility of having 'conservative behavior management group'. Further, the indications for providing dental treatment under conservative behavior management, sedation and general anesthesia are different. Thus, keeping either of these two groups as control group would not have allowed baseline equivalence. Also, it would have been unethical to administer general anesthesia when a treatment could have been possible under sedation as former has been considered to be less safe compared to latter. Thus, the possibility of having 'general anesthesia group' was also ruled out.

Conclusion

Deep sedation has got no effect on short term future anxiety and behaviour profile. This finding extrapolates to clinical necessity of completing the entire dental treatment in one appointment to eliminate the need for repeat administration of deep sedation.

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