Original Research Article

Comparative study on sedative effects of midazolam and propofol in conscious, agitated, uncooperative patients those admitted in the Emergency Department of Rajah Muthiah Medical College and Hospital

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Abstract

Background: Sedation is the depression of a patient's awareness of the environment and reduction of his or her responsiveness to external stimuli. Some decades ago, the emergency room procedures were conducted without adequate sedation of the patient, which landed upon various bitter events, like uncomfortableness for the patient, uncomfortableness for the doctor, failure of the procedure, high rate of complications.

Aim of the study: To study the onset of action, duration of action, and necessity of additive doses of sedation requirement of midazolam and propofol, to compare the sedative effects of OD midazolam and propofol.

Materials and methods: This observational study was conducted in the division of Emergency Medicine at Rajah Muthiah Medical College and Hospital, Chidambaram in the year October 2017 to August 2018. After formal approval from the Ethical committee, this study was conducted on 40

patients of either sex between age 20 – 50 years old. After proper IV access is acquired, calculated doses of Midazolam or Propofol were administered intravenously and data was collected. Selection of drug (either midazolam or propofol) was random. The patients were sorted into two groups namely, Group M – Midazolam received patients. Group P – Propofol received patients. Then the data were collected regarding the onset of action, duration of action, sedation scales, and vitals. Scales used to evaluate the effect of drugs were the Richmond Agitation Sedation Scale (RASS), and Ramsay scale.

Results: 32.5% of patients belong to toxicology by diagnosis and 30% of patients were pure medical cases, 15% belongs to hanging, and 7.5% of patients are trauma cases. 50% of patients were sedated for securing the airway, and 37.5% of patients were sedated to do procedures. 7.5% of patients received sedation to control seizures and 5% for Cardioversion. In Group P only 15% of patients required top-up dose, whereas in Group M 25% of patients required top-up dose. In Group P, the mean score was 4.35 and in Group M is 3.9, and so there is a statistically significant difference in the Ramsay scale. The difference in fall in systolic BP and respiratory rate between Group P and Group M was statistically significant. Also, there is a significant rise in SpO2 in Group P compared to Group M.

Conclusion: Propofol-induced sedation is quicker and effective than that of midazolam. The side effects produced by propofol are negligible and it is even safer when top-up doses are used. The recovery from propofol-induced sedation is faster, and it is even smoother than that of midazolam. So propofol can be safely used for effective sedation in ER.

Key words

Sedation Score, Ramsay Scale, Vital Signs, Propofol, Midazolam.

Introduction

This pathetic situation ultimately resulted in the advent of Procedural Sedation and Analgesia (PSA), which is now greatly helping the clinicians in achieving one of their most important goals to make the patient comfort [1]. When patients present to the emergency room, treating the pain and anxiety that accompany the chief complaints are critical to patient satisfaction and quality of care. Numerous indications like invasive procedures which are highly stressful, rapid sequence intubation, an agitated or confused patient who does not respond to reassurance may require sedation and even minor procedures may be facilitated and performed with more patient comfort [2]. Individual patient response to medications can vary, and therefore the clinicians can potentially overshoot the desired level of anesthesia. So prior to the administration of medications, clinicians must know the level of sedation required for a given procedure and appropriate dose of pharmacological agent chosen [3]. Sedation is the reduction of irritability or agitation by administration of sedative drugs, generally to facilitate a medical procedure or diagnostic procedure [4]. Drugs which can be used for sedation include propofol, etomidate, ketamine, fentanyl, and midazolam [5]. Sedation is now typically used in procedures such as endoscopy, vasectomy, RSI, or minor surgery and in dentistry for reconstructive surgery, some cosmetic surgeries, removal of wisdom teeth, or for high-anxiety patients [6]. Sedation methods in dentistry include inhalation sedation (using nitrous oxide), oral sedation, and IV sedation. Sedation is also used extensively in the intensive care unit so that patients who are being ventilated can tolerate having an endotracheal tube in their trachea [7]. Airway obstruction, apnea, and hypotension are not uncommon during sedation and require the presence of health professionals who are suitably trained to detect and manage these problems [8]. Sedation scales are used in medical situations in conjunction with a medical history in assessing the applicable degree of sedation in patients in order to avoid under-sedation (the patient risks experiencing pain or

distress) and over-sedation (the patient risks side effects such as suppression of breathing, which might lead to death). Typically, levels are (i) agitation, (ii) calm, (iii) responsive to voice only, (iv) responsive to tactile stimulation, (v) responsive to painful stimulation only, and (vi) unresponsive to painful stimulation [9, 10].

Materials and methods

This observational study was conducted in the division of emergency medicine at Rajah Muthiah Medical College and Hospital, Chidambaram in the year October 2017 to August 2018. After formal approval from the Ethical committee, this study was conducted among 40 patients of either sex between the age group 20 – 50 years. After proper IV access was acquired, calculated doses of Midazolam or Propofol was administered intravenously and data was collected. Selection of drug (either midazolam or propofol) was random. The patients were sorted into two groups namely, Group M – Midazolam received patients. Group P – Propofol received patients. The data collection included the onset of action, duration of action, sedation scales, and vitals. Scales used to evaluate the effect of drugs were the Richmond Agitation Sedation Scale (RASS), and Ramsay scale.

Inclusion criteria: Patients presenting to the Emergency Room in the agitated state who requires minimal procedures were included in the study.

Exclusion criteria: Patients with Bronchial asthma, and COPD, Acute upper and lower respiratory tract infections, Established systemic diseases like Hypertension, Diabetes mellitus, Tuberculosis, and Ischemic heart disease, Patients older than age 50 years, Gross obesity, Chronic malnutrition, Patients with compromised airway were excluded.

Statistical analysis

Data was collected on predesigned proforma for each individual case. Descriptive statistics were done for all data. Suitable statistical tests of comparison were done. The data was analyzed using SPSS version 16 for statistical analysis. Categorical variables were analyzed with the Chi-Square Test.

Results

Table - 1 shows the distribution of various variables regarding the age distribution diagnosis of the patients and indication for the sedation. Among total 40 patients, 45% (18 patients) of our study population belong to 41 – 50 years of age group, 42.5% (17 patients) belongs to 20 – 30 years and 12.5% (5patients) belong to 31 – 40 years of age group. 32.5% of patients belong to toxicology by diagnosis and 30% of patients were pure medical cases, 15% belongs to hanging, and 7.5% of patients were trauma cases. 50% of patients were sedated for securing the airway, and 37.5% of patients were sedated to do procedures. 7.5% of patients received sedation to control seizures and 5% for Cardioversion.

Table – 1: Characteristics of study subjects based on age, diagnosis, and indication of sedation.

Variables	Categories	N	%
Age	20-30	17	42.5
	31-40	5	12.5
	41-50	18	45.0
Diagnosis	Toxicology	13	32.5
	Hanging	6	15.0
	Trauma	3	7.5
	Pure medical	12	30.0
	Others	6	15.0
Indication for sedation	To secure airway	20	50.0
	Procedural	15	37.5
	To control seizures	3	7.5
	Cardioversion	2	5.0

Table - 2 shows the onset of action, duration of action and effect of sedation based on Ramsay scale and Richmond agitation sedation scale among both groups. The mean onset of action in Group P was 21 seconds, and in Group M was 33 seconds, which was found to be statistically

significant. The mean duration of action in Group P was 27 minutes, and in Group M was 19.65 minutes, which was also found to be statistically significant. The effect of sedation based on both Ramsay scale and RASS was also found to be statistically significant with the mean score of 4.35 among group P, 3.9 among group M and-3.1 among group P,-2.00 among group M respectively.

Table – 2: Comparison of midazolam and propofol based on onset of action, duration of action and effect of sedation.

Variable	Group	N	Mean	SD	t- value	P- value
Onset Of Action	P	20	21.00	7.18	3.207	0.005
	M	20	33.00	17.50		
Duration Of Action	P	20	27.00	14.18	7.32	0.01
	M	20	19.65	4.21		
Effect Of Sedation-Ramsay Scale	P	20	4.35	0.49	3.943	0.001
	M	20	3.90	0.31		
Effect Of Sedation-RASS	P	20	-3.10	0.55	6.850	0.001
	M	20	-2.00	0.46		

Table – 3: Comparison of vitals among the study subjects.

Vitals	Group	N	Mean	SD	t- value	P- value
PR	Group P	20	8.55	34.39	0.443	0.663 (Not Significant)
	Group M	20	5.00	15.35		
Systolic BP	Group P	20	9.50	12.76	2.774	0.012 (Significant)
	Group M	20	2.50	9.67		
Diastolic BP	Group P	20	5.50	8.87	1.917	0.07 (Not Significant)
	Group M	20	1.00	5.53		
RR	Group P	20	6.00	7.79	2.097	0.05 (Significant)
	Group M	20	0.90	4.85		
SpO_2	Group P	20	14.00	11.15	2.083	0.05 (Significant)
	Group M	20	7.25	8.28		

Table - 3 shows the comparison of vitals of the study subjects among both the groups. The difference in fall in systolic BP and respiratory rate between Group P and Group M was statistically significant. Also, there is a significant rise in SpO_2 in Group P compared to Group M.

Discussion

Our study population is not significantly varied by age group, and the majority of our population is male. With respect to diagnosis, we categorized our study population, just not only to analyze the incidence to ER but also to find which group requires sedation frequently. This shows that toxicology and pure medical cases require sedation frequently [11]. When we are going to talk about indication, it includes ER patients of all ages who have emergent or urgent conditions that require pain and/or anxiety management to successfully accomplish an interventional or diagnostic procedure as stated by Steven M., et al. [12]. Here the high-risk patients are included with the understanding that these patients are at increased risk of complications from sedation. In our study half of patients received sedation for securing their airway. Next majority goes for procedural sedation. Other indications include seizure control and Cardioversion [12]. All our patients received a standardized initial dose of propofol

100 mg or midazolam 2mg. With these standard doses of the drug, only a few patients required additive doses. This frequency of requirement of the top-up dose is more in patients receiving midazolam when compared to the patients received propofol. This may be due to the typical deep sedation experience produced by propofol as said by Charles J. [13]. Eames W, et al. said that the onset of action of propofol is essentially immediately after intravenous administration (one arm-brain circulation time). This statement is reflected in the same way in our study i.e. the onset of action of propofol is shorter than that of midazolam. This difference also stands statistically significant [14]. But, in our study, the duration of action of propofol is more prolonged than midazolam. This may be due to the increased dose of propofol [15]. To evaluate the effect of sedation of the drug, we definitely need scoring systems moreover it will be helpful in avoiding the complications of over and under sedation. Ramsay scale and Richmond Agitation Sedation Scale (RASS) are two scoring systems used in our study [16]. Both the scoring systems have given the same result in our study that propofol produces significantly deep sedation when compared to midazolam. We have used the RASS scale before and after giving the drug, which shows that propofol produces a remarkable change in the RASS scale [17]. When a study regarding sedation is conducted in an ER set-up, the important parameter to look after is the effect of sedation, rather than the adverse effects, because most of the patients reporting to an ER, will be restless or in the agitated state i.e. on the positive side of the RASS scoring system. In those situations our ultimate aim will be directed to shifting the patient to the other side of the scoring system i.e. calming down the patient [18]. According to our results, the above-mentioned aim can be easily achieved by using propofol. As mentioned early in the evaluation of the effect of drug completes, next comes the evaluation of adverse effects [19]. Volker Borges, et al. [20] did a study which shows that propofol and midazolam both are used safely and frequently in ER's. This holds good for our study also. Both the drugs didn't produce a significant fall in vitals. Systolic BP is the only one which got a significant fall in the propofol receiving patients, but this doesn't cause any life-threatening hypotension. So propofol can safely be used in ER at Level B recommendations. Beyond this, both the drugs were helped a much in improving the SpO2, by providing effective sedation. On comparing the change in vitals propofol has changed the vitals more than midazolam [20].

Conclusion

Propofol-induced sedation is quicker and effective than that of midazolam. The side effects produced by propofol are negligible and it is even safer when top-up doses are used. The recovery from propofol-induced sedation is faster, and it is even smoother than that of midazolam. So propofol can be safely used for effective sedation in ER

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