IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 8 Ser.1 (August. 2022), PP 47-52
www.iosrjournals.org

Use of propofol for sedation during endoscopy and colonoscopy: quality of awakening, patients' perception and side effects

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Abstract
Introduction: *Propofol is commonly used for sedation induction for endoscopy and colonoscopy. The objective of the present study was to investigate the quality of awakening, patients' perception and side effects of propofol sedation.*
Methods: *The present cross-sectional study was conducted in Ibn Sina D lab (hospital) including 226 patients who underwent endoscopy and/or colonoscopy. Prior to procedure, they received an initial intravenous dose of 0.5mg/kg of propofol along with required additional dose for adequate sedationaccording to the recommendations of the ASA Task Force on Sedation and Analgesia by Non-anesthesiologists.*
Results: *The average age of the patients was 44.7 (SD 16) years and 47% were female. More than 90% patients were in ASA grade I. Upper gastrointestinal endoscopy was done in almost 80.5% patients and colonoscopy was done in almost 30.5% patients. The average dose of total propofol required for sedation was 165.6 (SD 17.6) mg. Average duration of anesthesia was 10.5 minutes while average duration of procedure was 5.8 (SD 1.5) minutes. The average time required for recovery was 29 (SD 1.2) minutes. After recovery, average anxiety score was 2.7 (SD 1.2) and average pain score was 2.7 (SD 1.2).Most common side effects of propofol were pain at injection site (88.5%), burning sensation (43%), dizziness (6.6%), chest pain (5.7%),confusion (3.5%) and nausea (3%). Majority of the patients were satisfied with propofol.*
Conclusion: *Quality of sedation and awakening with propofol for endoscopy and colonoscopy was satisfactory with mild side effects.*
Keywords: *Propofol, Sedation, Anesthesia, Endoscopy, Colonoscopy*

Date of Submission: 21-07-2022 Date of Acceptance: 05-08-2022

I. Introduction

The endoscopy and colonoscopy of the gastrointestinal tract is a common routine procedure mostly done in an outpatient basis. Sedation is an important part of these procedures for conducting a smooth and good-quality endoscopy. Several sedative agents are used for this purpose including propofol.

Propofol is a hypnotic drug initially developed for the induction and maintenance of general anesthesia. However, considering its advantages over standard agents used for conscious sedation (eg, benzodiazepines and opiates) it is now commonly used for sedation in endoscopic and colonoscopic procedure. The advantages of this drug include a short onset of action and less patient discomfort, a shorter recovery period and, hence, earlier discharge from the endoscopy unit, less side effects and minimum requirement of supervision (1–4).

In recent years, multiple clinical studies have evidenced the safety and efficacy of propofol as a sedative agent for gastrointestinal endoscopy along with its rapid onset of action, improved patient comfort, as well as prompt recovery and discharge from the endoscopy unit (5–8). Besides it is reported that intravenous administration of propofol by gastroenterologists and trained endoscopy nurses is safe and effective in appropriately selected patients, hence, it requires minimum supervision of anesthesiologists (4). As a result, a number of professional societies including the American College of Gastroenterology, the American Gastroenterological Association, the American Society for Gastrointestinal Endoscopy, and the Canadian Association of Gastroenterology endorsed the use of propofol for endoscopy sedation by adequately trained endoscopists and endoscopy nurses(1,9).

In a resource-poor setting like Bangladesh, propofol might be the drug of choice for sedating the endoscopic patients for its advantages over the conventional therapy. The wide exceptance of the therapy mostly depends on the safety and efficacy level, reported side effects as well as patients' feedback. However, limited evidence is present in this regard from the patients of Bangladesh. Hence, the present study aimed to investigate the optimum required dose, quality of awakening, patients' perception and side effects of using propofol for endoscopy and/or colonoscopy.

II. Methods

Patients

The present one was a cross-sectional study conducted in the Ibn Sina D lab (hospital)from January 2022 to May 2022. All the consecutive patients aged >18 years of either sex visited to the center for routine endoscopy, colonoscopy and/or polypectomy were included in the present study. Patients younger than 12 years, with BMI > 40, or with a history of sleep apnea, prior adverse reactions to sedatives, serious drug allergies, frequent asthma crises, recent myocardial infarction, or decompensated illness (ASA class III or higher) were excluded from the study.

Pre-procedure preparation and assessment

Once the patients were taken to the endoscopy room, the attending physician informed the patient about the procedure (benefits, risks, limitations, and possible alternatives) of the procedure and sedation or anesthesia. An informed written consent was obtained from each participant. After that, a detailed medical history was obtained with emphasis on sedation-related issues such as major organ systems abnormalities, drug allergies, current medications, prior adverse reaction(s) to sedatives or anesthetics, recent hospital admission, and tobacco, alcohol, or illicit drugs use were evaluated. A thorough clinical examination was performed by the anesthesiologist including vitalsigns (arterial blood pressure, heart rate, pulse oximetry,temperature) and examination of heart, lungs, and airway. Before the administration of sedation, patients fasted for at least 8 hours(10).

Administration of propofol

The anesthetic procedure was conducted according to the recommendations of the ASA Task Force on Sedation and Analgesia by Non-anesthesiologists(10). Supplemental oxygen (2 L/min) was given to all patients unless specifically contraindicated. Monitoring included continuous electrocardiogram, noninvasive arterial blood pressure measurement, and oximetry. Then an initial intravenous dose of 0.5mg/kg of propofol was administered. After that, it was titrated in 10 to 20-mg increments to obtain appropriate sedation. Periods of 30 to 60 seconds were allowed between two injections of propofol to observethe drug effect before making the decision to administer the nextbolus. Other sedative drugs were used on a case-by-case basis. The depth of sedation was checked every 2 minutes using the validated scale published by the ASA Task Force (10).

Data collection

A structured case report form was used for collecting information on the following parameters: patients' sociodemographic characteristics, baseline clinical characteristics including BMI and blood pressure, required total dose of propofol, duration of endoscopic procedure, duration of sedation or anesthesia, patients' concern and satisfaction with propofol and side effects of propofol. Patients' psychomotor recovery after anesthesia was measured using the Critical Flicker Fusion Threshold (CFFT) (11). Level of anxiety and pain was measured using a visual analog scale (VAS).

Statistical analysis

All statistical analyses were done using STATA version 17.0. For continuous parameters, results were expressed as mean (SD).Categorical data were expressed using absolute frequencies and percentages.

III. Results

A total of 226 patients visiting the center for routine endoscopy and/or colonoscopy were included in the present study. Their mean age was 44.7 (SD 16) years and 47% of them were female. BMI of the majority of the patients was within the normal range (80%); 3.5% were underweight and 16% were overweight. Baseline mean blood pressure was 92 (SD 8.5) mmHg. Ischemic heart disease was the most common comorbidity (47%) followed by chronic liver disease (35%), type 2 diabetes mellitus (33%), hypertension (30%) and peptic ulcer disease (17%). More than 90% patients were in ASA grade I and the rest were in ASA grade II. Upper gastrointestinal endoscopy was done in almost 80.5% patients and colonoscopy was done in almost 30.5% patients (Table 1).

Table 1: Baseline characteristics of the patients (n = 226)

Characteristics	n or mean	% or SD
Age (years) (mean, SD)	44.68	16.04
Age (years) (n, %)		
18-30	49	21.68
31-40	57	25.22
41-50	41	18.14
51-60	37	16.37
>60	42	18.58
Gender (n, %)		
Male	120	53.10
Female	106	46.90
Height (m) (mean, SD)	6.37	11.65
Weight (kg) (mean, SD)	59.66	10.61
BMI (kg/m^2) (n, %)		
Under weight (<18.5)	8	3.54
Normal weight (18.5-24.9)	182	80.53
Over weight (>25.0)	36	15.93
Baseline Systolic BP (mmHg) (mean, SD)	121	11.19
Baseline Diastolic (mmHg) (mean, SD)	77	8.23

Mean BP (mmHg) (mean, SD)	91.87	8.54
Comorbidity (n, %)		
Ischemic heart disease	107	47.35
Chronic liver disease	79	34.96
Diabetes	74	32.74
Hypertension	69	30.53
Peptic ulcer disease	38	16.81
Malignancy	1	0.44
Chronic kidney disease	25	11.06
ASA grade (n, %)		
I	203	90.22
II	22	9.78
III	0	0.00
Cause (n, %)		
Endoscopy	182	80.53
Colonoscopy	69	30.53
Others (Polypectomy, ERCP)	3	1.33

The average dose of total propofol required for sedation was 165.6 (SD 17.6) mg. Average duration of anesthesia was 10.5 minutes while average duration of procedure was 5.8 (SD 1.5) minutes. The average time required for recovery was 29 (SD 1.2) minutes. After recovery, average anxiety score was 2.7 (SD 1.2) and average pain score was 2.7 (SD 1.2) (Table 2).

Table 2: Propofol related parameters of the patients

Parameters	**Mean**	**SD**
Dose of propofol (mg/kg)	2.62	0.71
Total requirement of propofol (mg)	165.66	17.61
Total duration of anesthesia (min)	10.49	1.65
Total duration of procedure (min)	5.85	1.50
Time required for recovery (min)	29.07	4.37
Anxiety score (VAS score)	2.71	1.19
Pain score (VAS score)	2.70	1.20

Having a headache after operation, feeling pain after operation, excitability and being afraid of the unknown consequence were the most common concerns of the patients regarding propofol anesthesia. However, more than 70% of the patients were satisfied with the anesthesia (Table 3).

Table 3: Patients' concern and satisfaction regarding propofol

Concern		
Having a headache after operation	151	66.81
Feeling pain after operation	134	59.29
Excitability	110	48.67
Being afraid of the unknown consequence	91	40.27
Anesthesia impairing judgement	80	35.4
Being asleep for a long time after the operation	60	26.67
Irritability	35	15.56
Crying	25	11.06
Being unable to wake up from anesthesia	15	6.64
Being nauseous after operation	13	5.75
Waking up in the middle of operation	3	1.33
Letting yourself fall into an unconscious state	1	0.45
Becoming paralyzed because of anesthesia	0	0.00
Afraid of death	0	0.00
Satisfaction		
completely satisfied	16	7.08
mostly satisfied	84	37.17
somewhat satisfied	58	25.66
neither satisfied or dissatisfied	42	18.58
somewhat dissatisfied	22	9.73
mostly dissatisfied	4	1.77

Most common side effects of propofol either reported by the patients or the anesthesiologist werepain at injection site (88.5%), burning sensation (43%), dizziness (6.6%), chest pain (5.7%),confusion (3.5%) and nausea (3%) (Table 4).

Table 4: Side effects of propofol

Side effects	n	%
Pain at injection site	200	88.5
Burning sensation	97	43.11
Dizziness	15	6.64
Chest pain	13	5.75
Confusion	8	3.54
Nausea	7	3.10
Drowsiness	2	0.88
Nausea	2	0.88
Problem with movement	2	0.88
Fever	1	0.44
Fainting	0	0.00
Muscle cramps	0	0.00
Spasms, pain or stiffness	0	0.00
Irregular pulse	0	0.00
Pounding in the ears	0	0.00
Laryngospasm	0	0.00
Allergy	0	0.00
Others	0	0.00
Vomiting	0	0.00

IV. Discussion

The level of sedation plays a significant role in quality of endoscopy as well as in patients' satisfaction. Several sedative agents are used for this purpose according to different guidelines. For example, for induction of moderate sedation which refers to a level of sedation where patients remain responsive to verbal commands with or without the need for light tactile stimulation, a combination of an intravenous benzodiazepine and opioid is preferred. For deep sedation, in contrast, propofol is commonly used (12).

Nowadays, propofol is preferred for sedation in gastrointestinal endoscopy for its advantages in rapid onset and recovery (9,12). However, this drug sometimes makes patients vulnerable to entry into general anesthesia, rendering them unconscious and potentially incapable of protecting their airway(12). Hence, evidence on the optimum doses for specific ethnic population, safety and quality of awakening and side effect profile is required for successful induction of sedation with propofol. Our study investigated these issues in 226 endoscopy and colonoscopy patients.

In our study, the average dose of total propofol required for sedation was 165.6 (SD 17.6) mg (dose 2.6 mg/kg). A previous study reported that mean propofol dose for upper GI endoscopy was 161 mg (range 50-650 mg) and for colonoscopy was 116 mg (range 30-500 mg) in addition to 25 mg of meperidine which is slightly higher compared to our study (4). Some studies recommended that an initial bolus of propofol of 0.5–1 mg/kg is administered intravenously, followed by a repeated bolus of 10–20 mg according to the patient's condition, or a continuous propofol infusion 2–6 mg/kg/h, with an additional bolus administered as needed(3).

In our study, the patients who received propofol sedation required an average of 29 (±1.2) minutes for recovery. After recovery, average anxiety score was 2.7 and average pain score was 2.7. A previous randomized controlled trial reported that the mean recovery time was 25 (±8) minutes (13). Another study reported that the mean sedation time after administration of propofol was 16.5 (9.3) minute which was somewhat shorter compared to our study (14). Besides, it was reported in several studies that quality of recovery wassignificantly better after propofol sedation(13,15). For example, psychomotor and driving skills after propofol sedation were similar to the baseline results which was better compared to midazolam (13).

A number of patients of our study were concerned about having a headache after operation, feeling pain after operation, excitability and being afraid of the unknown consequence after recovery. However, majority of the patients were satisfied with the propofol sedation. Some previous study reported similar finding where almost all the patients reported pleasant experience and responded that they would prefer to do the procedure under propofol sedation in the future(16,17).

Propofol has less side effects compared to conventional sedative agents (1). It maintains good hemodynamic stability, although it can induce a dose-dependent decrease in blood pressure and heart rate. Transient decreases in blood pressure are more prominent during bolus administration. Besides, majority of the side effects are mild. In our study, most common side effects of propofol were pain at injection site, burning sensation, dizziness, chest pain, confusion and nausea and majority of these were mild in severity. Studies reported that, side effects of propofol mostly depends on patients age, comorbidity and severity grade (18).

Our study has some limitations. First of all, it was a single center study including a small sample size. Moreover, the study did not have any control group to compare the outcomes. Further large-scale trials including control arm is suggested to compare the safety and efficacy of propofol with conventional therapy.

V. Conclusion

Our study suggests that quality of sedation and awakening was good with propofol during endoscopy and/or colonoscopy. Majority of the patients were satisfied with the therapy. Side effects of propofol sedation were mostly conventional like injection site pain and dizziness and were mild in severity.

Declarations

Ethics approval

The study was approved by the Institutional Review Board. Informed signed consent was obtained from all eligible participants who agreed to participate. The authors declare that the procedures followed the regulations established by the Helsinki Declaration of the World Medical Association.

Consent for publication: Not applicable.

Availability of data and materials: Patient-level data will be available on request from the corresponding author.

Conflict of interest: The authors declare that they have no competing interests.

Funding: The authors have no support or funding to report.

Acknowledgments

The authors would like to express their sincere gratitude to Pi Research Consultancy Center, Dhaka, Bangladesh (www.pircc.og) for their help in data analysis and manuscript revision and editing.

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