

Combining Propofol and Midazolam Versus Using Propofol Alone for Sedation in Interventional Procedures for Endoscopy

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ABSTRACT

Objective: to evaluate the hemodynamic stability, safety, and efficacy of propofol plus midazolam sedation against propofol alone for patient's undergoing endoscopic procedures. **Method:** A prospective cross-sectional study was carried out at Imam Zain Al-Abidin Hospital from January 3, 2026, to April 20, 2026. After being enlisted, seventy patients undergoing elective endoscopic operations were split into two equal groups. Propofol (0.25–1 mg/kg) was administered intravenously to Group A together with midazolam (0.01–0.1 mg/kg), whereas Group B got propofol (0.25–1 mg/kg) alone. Vital signs were recorded prior to, during, and following the surgery, including heart rate (HR), mean arterial pressure (MAP), and oxygen saturation (SpO₂). **Results:** The propofol midazolam group had a much longer recovery time (12.83 ± 1.71 min) than the propofol group (11.54 ± 1.40 min; $p = 0.002$). There were no discernible variations in SpO₂, HR, or MAP between the two groups. Propofol alone was linked to a higher propensity for hypotension, but the combo regimen produced deeper drowsiness with fewer reported side effects. **Novelty:** For endoscopic procedures, the combination of propofol and midazolam offers safer, more effective anesthesia with fewer side effects than propofol alone.

INTRODUCTION

Endoscope is typically secure and useful technique for diagnosing and treating a variety of gastrointestinal (GI) conditions, but it needs to be used in concert with other diagnostic modalities. A thorough work-up should always take precedence before endoscopy [1]. Medical practice concerning the gastrointestinal (GI) tract has improved due to advancements in endoscopic technologies. Compared to 2-dimensional scans and x-rays, direct inspection of the mucosal surface yields significantly more information. Furthermore, numerous surgical procedures have been replaced by endoscopic diagnosis and treatment of diseases [2].

Intravenous hypnotics like propofol are used to induce and maintain general anesthesia and drowsiness. Its favorable pharmacological effect profile has led to its widespread use. It works by potentiating the inhibitory neurotransmitter γ -aminobutyric acid (GABA) at the GABAA receptor. Disturbances in cardiopulmonary physiology are the primary side effects [3]. Anxiolytic, muscle relaxant, anticonvulsant, sedative, hypnotic, and amnesic, effect of midazolam which is a short-acting, fast-acting benzodiazepine having an imidazole structure. Different midazolam formulations are available for various medical conditions. Midazolam is an intravenous injection can produce sedation, anxiolysis, and amnesia when administers as premedication or during

endoscopic, therapeutic, or diagnostic procedures, as well as before surgery. Additionally, it can be used as a continuous intravenous infusion for sedation in critically ill patients who are intubated and on mechanical ventilation, as part of a balanced anesthetic approach, or for palliative sedation therapy [4]. When utilizing propofol for sedation, concurrent midazolam administration can lower the amount of propofol required for sufficient sedation. Consequently, concurrent midazolam administration can lower the amount of propofol administered and may also lower the frequency of airway blockage without changing the recovery profile [5]. By comparison of midazolam sedation for gastrointestinal endoscopy, propofol sedation results in higher endoscopist satisfaction scores, but may be due to decrease the blood pressure readings . [6]. The recovery period for a combination of propofol and opioid may be longer than that for propofol alone.

Aim of study

In terms of sedative efficacy, recovery profile, adverse effects, and hemodynamic stability during endoscopic procedures, the current study sought to evaluate propofol-midazolam combination therapy with propofol monotherapy.

Literature Review

Interventional endoscopic ultrasonography/endosonography (I-EUS) is a dynamic and rapidly advancing field within endoscopic procedures. Interventional endoscopic ultrasonography/endosonography procedures are classified into five categories based on their purpose and method: (i) EUS sampling; (ii) EUS-guided through-the-needle examination; (iii) EUS-guided drainage/anastomosis (EUS-D/A); (iv) trans-endosonographically/EUS-guided created route (trans-ESCR), and (v) EUS-guided delivery [7]. Sedation is commonly used for gastrointestinal endoscopy, but the type and amount of sedation administered is influenced by the complexity and nature of the procedure and patient factors. The elective and emergency nature of endoscopy procedures and local resources also have a significant impact on the delivery of sedation. In the UK, the vast majority of sedated procedures are carried out using benzodiazepines, with or without opiates, whereas deeper sedation using propofol or general anaesthetic requires the involvement of an anaesthetic team [8]. Propofol is a short-acting anesthetic, which can be used for procedural sedation. It has an onset of action of less than one minute and a short duration of three to 10 minutes. The endoscopist-directed administration of propofol has been shown to have a low risk of serious complications and is cost-effective [9,10]. Propofol is the most common used for sedation during endoscopic procedures. Data suggests its superiority to traditional sedatives used in endoscopy including benzodiazepines and opioids with faster onset of action and shortest post-procedure recovery times for patients [9].

The study "a comparative study of propofol alone and propofol combined with midazolam for dental treatments in special needs patients" by Lin et al. (2021) found that younger age, male sex, recognition issues, and the type of dental procedure in the dental treatment of patients with special needs are the factors associated with the combined use of propofol and midazolam, as well as that multiple dental procedures increase the

sedation time [10]. According to the study "Propofol vs. midazolam sedation for elective endoscopy in patients with cirrhosis" by Alexander Lata et al. (2020), patients with cirrhosis often need sedation for elective endoscopic operations. There are a number of sedation protocols available, but selecting the right sedative for patients with cirrhosis can be difficult. Research indicates that propofol has a lower rate of adverse events and a quicker recovery and patient discharge time than midazolam. According to these findings, propofol ought to be the drug of choice for sedation in patients [11]. Colonoscopy can cause a moderate amount of discomfort but typically lasts for a short time. It typically requires sedation, either through the use of benzodiazepines alone or in combination with opioids. Propofol has been widely used for endoscopic procedural sedation because it possesses favorable pharmacokinetic properties that allow rapid onset and return of consciousness with little residual effects. Despite its potent sedative qualities, propofol still has several drawbacks, including its narrow therapeutic range, injection site pain, reduced blood pressure, and respiratory depression which can lead to apnea [12]. Propofol sedation leads to improved endoscopist satisfaction levels when compared to midazolam sedation for endoscopy, but it may also increase the incidence of hypotension. The recovery period for a combination of propofol and opioid may be longer than that for propofol alone [13].

RESEARCH METHOD

Data collection

We looked through pubmed, Google Scholar, and Systematic Evidence Based Medical Reviews for the most recent research. Additionally, manual searches of current adult sedation in journals related to citation reviews and endoscopic test reviews afterward.

The first steps in this Aprospective cmpartiv include getting the patient's consent, getting his medical history, and making all the preparations required for general anesthesia, such as fasting and re-examinations by the anesthesiologist. The next step is to closely observe and document any changes in respiration and hemodynamics during surgery. Following the patient's admission, we spoke with him and explained the kind of sedation method that will be applied. After getting their consent, we began by closely monitoring the patient's MAP, heart rate, and Spo2 for any changes that might point to a cardiopulmonary complication. Finally, we had to divide the patients into two groups based on the type of medication they were taking and how it was administered.

Sample Size

The study's subjects are people who recently had an endoscopic test, and samples are chosen using convince sampling after their agreements. Patients who have had an endoscopic examination at a hospital must fulfill the requirements for inclusion in order to be included in this study (elective cases, ASA I, II, age, patient permission, and NPO). These patients are the participants in the trial. Seventy patients in all, split into two groups based on the medicine and mode of administration, participated in this study.

Group A received 0.01_0.1 mg/kg of midazolam and 0.25_1 mg/kg of IV propofol

Group B received 0.25-1 mg/kg of IV propofol.

Study of design

Group A consists of 35 people, evenly divided between the sexes, and corresponds with the study size that was chosen. Additionally, before we begin the cardiopulmonary monitor (heart rate, MAP, and Spo2), the patient should be laying flat on the bed. A 20-gauge IV cannula was inserted as well. After everything is in order, we are prepared to provide an IV sedative dose to the patient. Maybe starting IV sedative infusions, like using midazolam at a specific dose of 0.01-0.1 mg/kg and propofol at dosages of 0.25-1 mg/kg. The patient is constantly watched for changes in blood pressure, oxygen saturation, and heart rate after the injection. Oxygen saturation (HR, MAP, and Spo2) to check for symptoms like bradycardia, hypotension, and apnea as well as any potential respiratory depression. Throughout the process, these indicators must be continuously monitored, and any changes must be documented.

Additionally, group B has thirty-five members that were chosen at random because this is group A. Among all of these in both sexes. As a result, anesthesiologists must start by monitoring the device as mentioned in group A, reevaluate the patient, and give them intravenous propofol at a dose of 0.25-1 mg/kg. When the patient appears to be asleep and the effects of the propofol injection begin to take effect, monitoring equipment is positioned to track any changes in heart rate, MAP, and Spo2.

Setting of this study

It is important to note that this study, which was conducted in the endoscopy suite at Imam Zain Al-Abidin Hospital from January 3, 2026, to April 20, 2026, contained 70 patients. Prior to proceeding, each patient's parents gave their verbal consent to participate in the trial, and the anesthesiologists in charge at "Imam Zain Al-Abidin Hospital" conducted a primary assessment of each patient's anesthesia risk.

Process of the study

Following the compilation of the hospital patient list, the data status – whether it was complete or missing – was evaluated. A randomly chosen sample was removed from the study and another subject was substituted using the same random approach if there was a significant amount of missing data. Computers were used to gather and record all of the data, excluding personal information. After extracting the data into an Excel file and reviewing it, the researcher filled in the gaps with clinical data and patients who had a lot of missing information. Patients with substantial missing data and those without the required medical documents were not allowed to participate in the trial.

RESULTS AND DISCUSSION

Results

Table 1. Comparison of the (propofol and midazolam) group and Propofol group According to their medical characteristics

Medical Characteristics	Subgroup	Propofol and Midazolam		Propofol		t-test analysis		
		f.	%	f.	%	t	Df	p. value
ASA	class I	20	57.1	20	57.1	-.239-	34	.812
	class II	14	40.0	13	37.1			
	class III	1	2.9	2	5.7			
	Total	35	100.0	35	100.0			
Endoscopy type	Gastro	15	42.9	30	85.7	3.263	34	.003
	Colon	10	28.6	2	5.7			
	Gastro & Colon	10	28.6	3	8.6			
	Total	35	100.0	35	100.0			
Side effect	no	35	100.0	34	97.1	-1.000-	34	.324
	agitation	0	0	1	2.9			
	Total	35	100.0	35	100.0			
Duration of recovery (min)		Min – Max		Min – Max		3.277	34	.002
		10- 16 m		10- 15 m				
		Mean ± SD 12.83 ± 1.706		Mean ± SD 11.54 ± 1.40				
Duration of Endoscopy (min)		Min – Max		Min – Max		1.430	34	.162
		15- 60 m		10- 60 m				
		Mean ± SD 30.14± 15.63		Mean ± SD 25.31± 13.40				

P=probability value, NS: Non-Significant at $P > 0.05$, S: Significant at $P < 0.05$, HS: Highly Significant at $P < 0.001$.

The results in table 1: showed there were a significant statistical differences between the (propofol and midazolam) group and Propofol group according to the endoscopy type and duration of recovery at $P < 0.05$. And the propofol + midazolam is more indepth for sedation and less side effect on the patient.

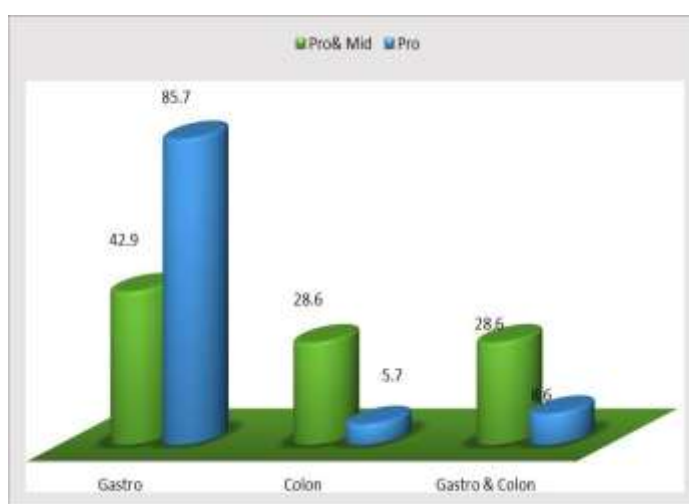


Figure 1. Differences between the (propofol and midazolam) group and Propofol group according to the endoscopy type.

Table 2. Compare which of the drugs is more stable for vital signs:

Parameters			Propofol and Midazolam		Propofol		t-test analysis		
							T	Df	p. value
SPO2 %	Before	Min – Max	92	100	95	100	-.232-	34	.818
		Mean ± SD	98.31	1.859	98.40	1.193			
	During	Min – Max	94	100	94	100	-.780-	34	.441
		Mean ± SD	98.20	1.389	98.43	1.290			
	After	Min – Max	93	100	96	100	.437	34	.665
		Mean ± SD	98.51	1.541	98.40	.881			
HR	Before	Min – Max	66	112	70	108	.415	34	.681
		Mean ± SD	84.09	10.839	83.11	7.279			
	During	Min – Max	65	105	71	99	-.265-	34	.793
		Mean ± SD	81.83	10.328	82.40	6.395			
	After	Min – Max	70	99	70	91	.343	34	.734
		Mean ± SD	83.23	8.296	82.71	4.212			
MAP	Before	Min – Max	74	120	85	132	-2.234-	34	.052
		Mean ± SD	95.45	11.071	101.25	10.231			
	During	Min – Max	73	111	50	130	-.680-	34	.501
		Mean ± SD	87.13	9.404	89.30	15.317			
	After	Min – Max	76	109	74	104	-.091-	34	.928

Parameters	Propofol and Midazolam		Propofol		t-test analysis		
					T	Df	p. value
Mean $\pm$ SD	92.05	8.460	92.21	7.295			

P=probability value, NS: Non-Significant at $P > 0.05$, S: Significant at $P < 0.05$, HS: Highly Significant at $P < 0.001$.

The results in table 2 showed there were non-significant statistical differences in Parameters before, during and after anesthetic drug between the (propofol and midazolam) group and Propofol group at $P > 0.05$, and the Propofol drug is more stable for vital signs.



Figure 2. The differences in mean between before, during and after in MAP for (propofol and midazolam) group and Propofol group.

We collected 70 patients and classified them according to drug received into two groups (group A and group B) at random. Group B received propofol, while group A received both propofol and midazolam. The first group's mean age of participants was 41.11 ± 18.18 years, while the propofol group's mean age was 42.86 ± 19.26 years. According to the recovery time data showed The second group had a much longer recovery time (12.83 ± 1.71 min) than the propofol alone group (11.54 ± 1.40 min; $p = 0.002$). Hemodynamically such as (SpO_2 , HR, or MAP), we noticed that There were no No significant differences before, during, and after procedures. Propofol alone was linked to a higher propensity for hypotension, but the combo regimen produced deeper drowsiness with fewer reported side effects. Age, gender, weight, ASA, side effects, kind of endoscopy, length of endoscopy, recovery, SPO_2 , MAP, HR, respiratory complications.

Discussion

The effects of propofol-midazolam and propofol alone in patients undergoing endoscopic sedation were examined in our cross-sectional investigation.

Because of their high potency, short half-lives, and low potential for side effects, the samples in group A that received propofol and midazolam were preferred over others. Using a combination of these drugs for endoscopy sedation could lead to a quick induction time, a quick recovery, stable cardiorespiratory conditions, and the rare need for additional sedation. It is also appropriate and safe for this purpose.

Due in part to ease of administration, the sample in group B was given propofol alone at a dose of 0.25–1 mg/kg. Short induction and quick recovery times, as well as hemodynamic instability that results in severe hypotension, are significant issues with utilizing propofol to sedate for endoscopic procedures.

This study was similar to other research, with a few exceptions. According to Jang et al. (2022), propofol-based sedation was safe and effective for patients who had paradoxical reactions to midazolam; the procedure and recovery periods did not differ between groups [14]. Colonoscopy can cause a moderate amount of discomfort but typically lasts for a short time. It typically requires sedation, either through the use of benzodiazepines alone or in combination with opioids] Propofol has been widely used for endoscopic procedural sedation because it possesses favorable pharmacokinetic properties that allow rapid on-set and return of consciousness with little residual effects Despite its potent sedative qualities, propofol still has several drawbacks, including its narrow therapeutic range, injection site pain, reduced blood pressure, and respiratory depression which can lead to apnea [15]. Propofol is a potential alternative sedative agent for use during colonoscopy, though it often leads to deeper sedation than with traditional sedatives used for colonoscopy. Many jurisdictions require anesthesiologists to administer propofol [16].

CONCLUSION

Fundamental Finding: This study demonstrates that utilizing propofol-midazolam combination instead of propofol alone to sedate during endoscopy enables a more efficient use of the endoscopic technique. This combination provided effective sedation for endoscopic procedures while maintaining satisfactory hemodynamic stability and a low incidence of adverse events. **Implication:** The combination regimen may therefore represent a useful option for patients undergoing longer or more complex endoscopic procedures. **Limitation:** In addition to recovery time was slightly longer than with propofol alone, the difference was clinically acceptable. **Future Research:** Future research should involve larger randomized studies in different endoscopic settings to further compare propofol-midazolam combination and propofol alone in terms of sedation quality, recovery profile, hemodynamic stability, adverse events, and their suitability for longer or more complex endoscopic procedures.

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