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EVALUATION OF SEDATION IN UPPER GASTROINTESTINAL ENDOSCOPY- COMPARISON OF DEXMEDETOMIDINE, MIDAZOLAM AND PROPOFOL: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT **Background:** Moderate sedation in upper GI endoscopy facilitate smooth conduct of the procedure and enhance safety and satisfaction.(1) This study compares sedation score, haemodynamic stability and complications in patients receiving dexmedetomidine, midazolam and propofol. **Methods:** In this prospective study, 90 adult patients (ASA I-II, aged 18–60) were randomized into three groups (n=30 each): Group D (Dexmedetomidine: 1 mcg/kg loading, 0.4–0.5 mcg/kg/hr maintenance), Group M (Midazolam: 0.03 mg/kg loading, 0.03–0.06 mg/kg/hr maintenance), and Group P (Propofol: 1 mg/kg loading, 2–3 mg/kg/hr maintenance). **Results:** Group P achieved the highest mean Ramsay Sedation Score (RSS) at baseline (3.1 ± 1.02) compared to Group D (2.93 ± 0.25) and Group M (2.7 ± 0.47) ($p < 0.001$). Rescue sedation was required by 26.7% of Group M, 6.7% of Group D, and 0% of Group P ($p < 0.05$). Retching and gagging were significantly higher in the Midazolam group (60%) compared to Dexmedetomidine (30%) and Propofol (20%). Recovery was uniform across groups, with all patients reaching a maximum Aldrete score of 10 by 30 minutes post-procedure. **Conclusion:** Propofol provides the deeper sedation with zero rescue requirements. Dexmedetomidine offers superior hemodynamic stability and reduced gagging compared to Midazolam, making both Propofol and Dexmedetomidine better choices for ambulatory UGI endoscopy.

KEYWORDS : Dexmedetomidine, Hemodynamic Stability, Midazolam, Propofol, Ramsay Sedation Score, Sedation, Upper Gastrointestinal Endoscopy.

INTRODUCTION

Upper gastrointestinal (UGI) endoscopy is the gold standard for diagnosing and treating oesophageal, gastric, and duodenal disorders.(2) While essential, the procedure can be distressing, leading to sympathetic surges (increased heart rate and blood pressure) and patient discomfort. Sedation aims to provide anxiolysis, analgesia, and amnesia while maintaining hemodynamic and respiratory stability. This study compares three distinct agents: Dexmedetomidine (an α2-agonist), Midazolam (a benzodiazepine), and Propofol (a GABA receptor potentiator) to determine the optimal sedative regimen

AIMS AND OBJECTIVES

1) To compare intra procedure and post procedural sedation score of patients undergoing upper gastrointestinal endoscopy under sedation of dexmedetomidine, midazolam and propofol
2) To compare the periprocedural haemodynamic stability of patients under sedation of dexmedetomidine, midazolam and propofol undergoing upper gastrointestinal endoscopy
3) To compare complications like retching, gagging, choking in these three groups

MATERIALS AND METHODS

This prospective observational study was conducted after receiving approval from Institutional Ethical Committee. Written informed consent was taken from all participants after a detailed explanation of risks and benefits of the study.

The study enrolment focused on adult patients aged 18 to 60 years with an American Society of Anaesthesiologists (ASA) physical status of Grade I or II, weighing between 50 and 90 kg, and scheduled for elective diagnostic endoscopy. To ensure a homogenous study population and minimize complications, patients were excluded if they presented with pregnancy, bleeding diathesis, a history of prior gastric surgery, or established cardiac arrhythmias.

90 participants were randomized into three distinct groups to receive specific sedation protocols. After attaching standard monitors, premedication was given to all patients. Group D was administered dexmedetomidine with a loading dose of 1 mcg/kg delivered over 10 minutes, followed by a maintenance infusion of 0.4–0.5 mcg/kg/hr. Group M received midazolam, initiated with a 0.03 mg/kg loading dose and maintained at a rate of 0.03–0.06 mg/kg/hr. Group P received propofol, consisting of a 1 mg/kg loading dose and a subsequent maintenance infusion of 2–3 mg/kg/hr. Procedures commenced only once a Ramsay Sedation Score (RSS) of ≥3 was attained. Rescue sedation (20%- 30% of loading dose of the group) was specifically required if patients exhibited significant discomfort or movement that hindered the endoscopist, or if the depth of sedation was deemed insufficient for the procedure.

Throughout both the intraoperative and postoperative phases, patients were closely monitored for safety and clinical response at intervals of 2 min till 10 min then 5 min intraoperatively and at 15min interval postoperatively. Vital signs, including heart rate (HR), systolic blood pressure (SBP), mean arterial pressure (MAP), and peripheral oxygen saturation (SpO2) were recorded. Additionally, the depth of sedation was systematically evaluated using the Ramsay Sedation Score (RSS) to assess the efficacy and consistency of each pharmacological agent. Infusions were stopped 10 mins before completion of procedure.

RESULTS

A total of 90 patients were enrolled and randomised into 3 groups of 30: Group D (dexmedetomidine), Group M (midazolam), Group P (propofol)

The demographic profiles of the three groups were comparable, with no significant differences in mean age, weight, height, or In terms of sedation efficacy, Group P achieved deeper and more consistent levels of sedation, recording the highest mean Ramsay Sedation Scale (RSS) score at the start of the procedure (3.1 ±1.02) compared to Group D (2.93 ± 0.25) and Group M (2.7 ± 0.47) ($p < 0.001$). This stability was reflected in the need for rescue sedation, which was highest in Group M (26.7%) and Group D (6.7%), while Group P required zero rescue interventions ($p < 0.05$) gender distribution.

Hemodynamically, both the dexmedetomidine (Group D) and propofol (Group P) groups maintained significantly lower pulse rates compared to the midazolam group (Group M) at most intraoperative time points ($p < 0.001$ to $p = 0.007$)2. While systolic blood pressure and mean arterial pressure (MAP) showed some variation—with Group P exhibiting lower MAP at specific intervals—all parameters remained within clinically acceptable ranges, and no major hypotensive episodes requiring intervention occurred. Respiratory stability was high across all cohorts; oxygen saturation (SpO2) remained consistently optimal, with no instances of desaturation below 92%, bradypnea, or respiratory depression.

Complication like retching and gagging were most frequent in Group M (60%), followed by Group D (30%) and Group P (20%). Shivering was observed exclusively in 20% of the propofol group. Despite these variations, recovery was uniform and rapid; all patients reached a maximum Aldrete recovery score of 10 by 30 minutes post-procedure, indicating full readiness for discharge.

Table 1: Ramsay Sedation Scale (RSS) Scores

Time Point	Group D	Group M	Group P	P value	
Intra Operative					
0 min	2.93±0.25	2.7±0.47	3.1±1.02	<0.001	**HS**
2 min	2.77±0.43	2.53±0.51	2.87±0.35	0.017	S
4 min	2.8±0.41	2.27±0.52	2.97±0.18	<0.001	**HS**
6 min	2.8±0.41	2.07±0.64	2.93±0.25	<0.001	**HS**
8 min	2.9±0	2.07±0.78	3.17±0.38	<0.001	**HS**
10 min	2.87±0.35	1.73±0.78	2.9±0.31	<0.001	**HS**
15 min	1.5±0.51	1.56±0.77	2.97±0.41	<0.001	**HS**
20 min	1.2±0.41	1.69±0.85	2.24±0.58	<0.001	**HS**

Table 2: Pulse Rate (beats/min)

Time Point	Group D	Group M	Group P	P-value	
Intra Operative					
0 min	86.47 ± 10.7	97.67 ± 13.25	84.47 ± 11.54	<0.001	HS
2 min	91.6 ± 9.58	104.67 ± 13.58	89.93 ± 11.45	<0.001	HS
4 min	96.27 ± 8.75	104.73 ± 13.84	93.47 ± 8.69	0.002	S
6 min	96.87 ± 7.46	106 ± 13.52	93.33 ± 7.42	<0.001	HS
8 min	97.33 ± 7.11	104.93 ± 13.72	92.73 ± 7.06	<0.001	HS

Table -3 Oxygen Saturation (SpO_2, %)

Time Point	Group D	Group M	Group P	P value	
Intra Operative					
0 min	98.87±0.35	98.57±0.73	98.3±1.02	0.07	NS
2 min	98.9±0.31	98.47±0.82	98.23±1	<0.001	HS
4 min	98.9±0.31	98.97±0.20	98±1.02	<0.001	HS
6 min	98.93±0.25	98.97±0.21	97.97±1.19	<0.001	HS
8 min	98.8±0.48	98.97±0.22	98.17±1.26	0.040	S

Table 4: Complications

Complication	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	Midazolam Group (n=30)
Bradycardia	0	0	0
Bradypnea	0	0	0
Respiratory depression	0	0	0
Hypoxemia (SpO_2<92%)	0	0	0
Nausea/Vomiting	0	0	0
Retching/gagging	9(30%)	6(20%)	18(60%)
Shivering	0	6(20%)	0
Total patients with complications	9(30%)	12(40%)	18(60%)

DISCUSSION

Upper gastrointestinal endoscopy under sedation has significantly revolutionised gastroenterology by improving patient comfort, procedural quality, and diagnostic capabilities. Although it requires a trained anesthetist, for the procedure to be conducted smoothly, moderate sedation has to be given which itself is an art. Monitored anaesthesia care is the anaesthetic technique used in upper GI endoscopy to provide moderate sedation.

This prospective observational study recruited 90 patients, randomized into 3 groups each of 30 - Group D (Dexmedetomidine), Group M (Midazolam) and Group P (Propofol).

The demographic data across the three cohorts (n=90) was well-matched, with no significant differences in age, weight, or BMI. The mean age ranged from 32.6 to 38.3 years, with a slight male predominance in all groups. This demographic homogeneity aligns with the methodology used by Takimoto et al. (2011)(3), ensuring that the observed pharmacological variations were not confounded by baseline patient characteristics. All subjects maintained stable profiles throughout the procedure, ultimately achieving high Aldrete scores indicative of excellent postoperative recovery.

Hemodynamically, dexmedetomidine and propofol demonstrated superior cardiovascular stability compared to midazolam. Throughout the intraoperative period, pulse rates were significantly lower in the dexmedetomidine and propofol groups ($p<0.001$ to $p=0.007$). These findings corroborate Sethi et al. (2014)(4), who noted that dexmedetomidine's alpha2-adrenoreceptor agonism effectively attenuates the sympathetic "pressor response" to endoscopic stimulation. Furthermore, while Samson et al. (2014)(5) noted significant MAP reductions with propofol, in this study MAP was maintained within clinically acceptable ranges. Crucially, no respiratory depression or oxygen desaturation ($SpO2$ >90%) occurred in any group, supporting the safety of these agents. This contradicts the respiratory risks often associated with deeper sedation, echoing Takimoto et al. (2011) (3)and Elsa Mahi et al. (2021)(6), who found no significant variation in respiratory parameters between dexmedetomidine and other agents.

Regarding sedation quality, propofol achieved the deepest and most consistent levels of sedation. However, dexmedetomidine provided an optimal target range (RSS 2–3) that allowed for better patient-physician interaction, a finding supported by Takimoto et al. (2011)(3). Patient satisfaction, measured via VAS, was highest in the propofol group, followed by dexmedetomidine, while the midazolam group recorded the lowest satisfaction scores. This correlates with the incidence of patient movement; retching and gagging were observed in 60% of midazolam patients, compared to only 30% and 20% in the dexmedetomidine and propofol groups, respectively. The superior suppression of the gag reflex by dexmedetomidine and propofol significantly reduces procedural interruptions and improves long-term tolerance for repeat endoscopies.

The study also highlighted significant differences in complication and recovery rates. The overall complication rate was lowest in the dexmedetomidine group (30%), primarily due to the reduction in gagging—a finding consistent with Sethi et al. (2014)(4), who reported gag responses in 97% of midazolam patients versus 23% in dexmedetomidine patients. Shivering was observed exclusively in the propofol group (20%), likely due to its thermoregulatory effects. Rescue sedation was required in 26.7% of the midazolam group and 6.7% of the dexmedetomidine group, while the propofol group required none, indicating its superior sedation stability. Despite these differences, all three agents proved suitable for daycare procedures, as all patients achieved a maximum Aldrete recovery score of 10 within 30 minutes, allowing for safe and timely discharge.

Finally, the recovery profiles across all three groups emphasize their suitability for modern ambulatory or "daycare" surgical settings. A critical metric for discharge in endoscopy units is the rapid return of cognitive and motor functions. In this study, every patient across all three cohorts achieved a maximum Aldrete recovery score of 10 within 30 minutes of the procedure's conclusion. While propofol is traditionally celebrated for its "clear-headed" recovery, this data suggests that carefully titrated infusions of dexmedetomidine and midazolam do not significantly delay discharge. Ultimately, while midazolam remains a safe and cost-effective option, the superior suppression of the gag reflex and better hemodynamic control offered by dexmedetomidine and propofol make them preferable for high-volume units focused on maximizing procedural success and patient comfort.

The open-label design lacked blinding, potentially introducing observer bias, while procedural variations among endoscopists affected sedative dosage and duration. Furthermore, the absence of age-adjusted dosing and the study's single-center nature with a small sample size may limit generalizability and the detection of rare complications. Finally, the short duration of the observed procedures may not fully reflect the requirements of more complex clinical scenarios.

CONCLUSION

In our study, we concluded that Dexmedetomidine, Propofol, and Midazolam are all safe and effective for sedation during routine upper GI endoscopy under monitored anaesthesia care. However, Dexmedetomidine offered better hemodynamic stability and fewer complications, while Propofol provided deeper sedation and lower pain scores with rapid recovery. Midazolam was effective but showed slightly more hemodynamic variability. Dexmedetomidine appears preferable for balanced sedation and safety, but choice of agent should be individualised as per patient and procedural needs.

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