Original Article

Dexmedetomidine as an Adjunct to Propofol for Sedation in Patients undergoing Endoscopic Retrograde Cholangiopancreatography

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Abstract

Background: *Endoscopic retrograde cholangiopancreatography (ERCP) often requires moderate sedation to ensure patient comfort and procedural success. Propofol is widely used but may cause hemodynamic instability and respiratory depression at higher doses. Dexmedetomidine, an á2-adrenergic agonist with sedative and analgesic properties, may reduce these adverse effects when used as an adjunct. This study evaluated the effectiveness of dexmedetomidine in combination with propofol for moderate sedation during ERCP.*

Methods: *This prospective study was carried out at Dhaka Medical College Hospital between March 2019 and July 2022. Thirty patients (ASA I–III) were included. Each patient received Dexmedetomidine (1 ìg/kg over 10 minutes), followed by propofol as needed to maintain an RSS of 4. Throughout the procedure, we monitored depth of sedation, hemodynamics, oxygen saturation, pain scores, total propofol and opioid use, and recovery time.*

Results: *The mean onset of sedation was 4.25 ± 1.45 minutes. RSS values remained stable throughout the procedure. Dexmedetomidine was associated with a moderate reduction in heart rate but without clinically significant hypotension or oxygen desaturation. The lowest SpO, observed was 97.5 ± 1.9%. Analgesic requirements were minimal, with F-PRS remaining low except at 25 minutes. Total propofol (75.5 ± 6.2 mg) and opioid consumption (52.5 ± 6.7 µg) were reduced. Recovery was rapid, with a mean time of 5.65 ± 1.45 minutes.*

Conclusion: *Dexmedetomidine as an adjunct to propofol provides effective, stable moderate sedation during ERCP, offering hemodynamic stability, reduced sedative and opioid requirements, minimal respiratory compromise, and faster recovery. Its use may enhance both patient safety and procedural efficiency.*

Key Words*: Conscious sedation, Dexmedetomidine, ERCP.*

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Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is now a primary diagnostic and therapeutic option for pancreaticobiliary pathologies.[1] Patients undergoing ERCP are often in poor health and may experience with pain, anxiety, and nausea if not adequately sedated.[2] ERCP procedure involving papillotomy, sphincterotomy, dilatation of ampulla of Vater, stent removal needed for moderate sedation.[3] There are many challenges during moderate sedation for ERCP in endoscopy unit; as remote location, less familiar area, semi prone

position, lengthy procedure and shared airway.[4]

Moderate or conscious sedation there is purposeful response to verbal or tactile stimulation, usually no airway intervention required, spontaneous ventilation and cardiovascular function is maintained. But in general anaesthesia needed longer preparation time, induction, intubation and reversal which leads to more duration and cost in this procedure.[5] To improve patient clinical outcome, increasing patient satisfaction, moderate sedation uses as an alternative to general anaesthesia in gastrointestinal endoscopy procedure.[6,7]

A number of agents are available for moderate sedation during endoscopic procedures, including benzodiazepines, opioids, propofol, and dexmedetomidine.[8,9] Propofol is most commonly used in day-case procedures due to its rapid onset and short half-life, allowing patients regain normal mental activities shortly after intravenous administration. However, high dose propofol can lead to serious adverse effects such as hypotension and hypoxia, which are common during gastrointestinal endoscopy.[10] Prolonged hypoxia is a significant concern as it can lead to cardiac arrhythmia and coronary ischemia. Additionally, propofol's analgesic effects are insufficient to manage visceral traction pain.[11]

Dexmedetomidine (DEX) is a potent, highly selective á2-adrenergic receptor agonist. It has the properties of sedation, analgesia, anxiolysis, and sympathetic tone inhibition.[12,13] Dexmedetomidine has recently gained popularity in gastrointestinal endoscopic procedures due to its superiority over conventional sedatives, including cooperative or semi-rousable sedation, minimal respiratory depression at high doses, and also maintaining hemodynamic stability.[14,15,16]

Mukhopadhyay et al. found dexmedetomidine could reduce propofol requirement and provide a more stable level of sedation during ERCP procedure.[17] However, it was proved that dexmedetomidine infusion alone was not as effective as propofol on sedation quality and was associated with significantly low blood pressure and heart rate and prolonged recovery time.[18,19] Hence, various agent used as adjunct such midazolam, fentanyl, remifentanil, dexmedetomidine etc. to reduce total propofol requirement and consequently its adverse effects also increasing level of analgesia.

So, in this study we aim to investigate the efficacy of dexmedetomidine as an adjunct drug to propofol for moderate sedation during ERCP procedures. We evaluate its effects on hemodynamics, respiratory effects also onset of sedation and recovery time.

Methodology

This is a prospective study, carried out in the department of Anesthesia, Pain, Palliative and Intensive care medicine, Dhaka Medical College Hospital, Dhaka in the period of March 2019 to July 2022. A total 30 patients of ASA class I, II and III undergoing ERCP had participated according to inclusion criteria. Patients with known hypersensitivity to study drugs, difficulty in communication, uncontrolled comorbidity, long term opioid use or alcohol use and patients whom converted to general anaesthesia were excluded from the study. Purposive sampling technique was followed. Patients had received dexmedetomidine 1ìg/kg intravenous (IV) bolus in 10 min. After that propofol 1mg/kg bolus dose was given, then intermittently 20mg IV given to achieve Ramsay sedation score-4. Depth of sedation, hemodynamics, SpO, , pain during procedure, recovery time, total requirement of propofol and analgesics were observed and noted. Statistical analyses of the results were obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-24), where required.

Results

Table 1: Distribution of the patients according to the demographic characteristics

Characteristics	Value
Age (years)	55.4±4.2
Weight (kg)	54.6±5.4
ASA status, (n)	
Class I	11(36.7%)
Class II	19(63.3%)
Gender, (n)	
Male	12(40%)
Female	18(60%)
Duration of procedure (min)	27.8±4.9

Values are presented as mean ± SD for continuous variables and n (%) for categorical variables.

On the basis of demographic characteristics of the patients, the mean age of patients 55.4±4.2 years. Maximum patients were ASA Class II and most of the patients had female gender. Average duration of procedure was 27.8±4.9 minutes.

Table II: Assessment of onset of sedation time by RSS score.

Variables	Mean ± SD
Onset of sedation time (RSS>4)(min)	4.25±1.45

Values are expressed as Mean ± SD.

On assessment of onset of sedation time by RSS score, mean onset of sedation adjunct with dexmedetomidine was 4.25±1.45min.

Table-III: Assessment of periprocedural RSS scores

RSS (Score)	Mean ± SD
Beginning of ERCP	4.15±0.8
5min	4.1±0.7
10min	4.2±0.5
15min	4.1±0.6
20min	4.3±0.5
25min	4.15±0.6
30min	4.10±0.4
35min	3.8±0.8
40min	3.5±0.8

Values are expressed as Mean ± SD.

The RSS scores were higher at those point of time where the patients deeply sedated. Mean sedation scores ranged from 3.5±0.8 to 4.3±0.5. RSS score was increased after giving rescue sedative at 10min and 20min.

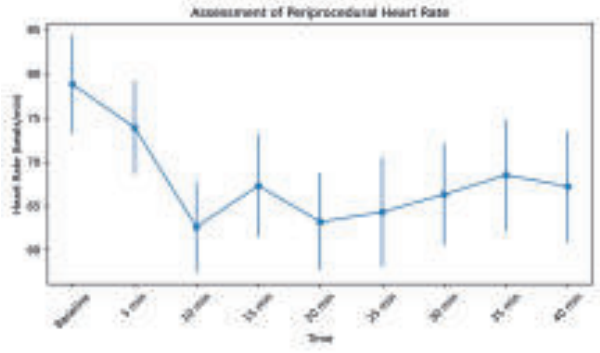

Figure 1: Assessment of periprocedural heart rate

In respect to heart rate, patients had gradually decrease in heart rate from the baseline. At baseline heart rate of the patients was 78.8±5.6, after 10 mins it was the lowest 62.6±5, also at the point time 20min heart rate was 63.2±5.5.

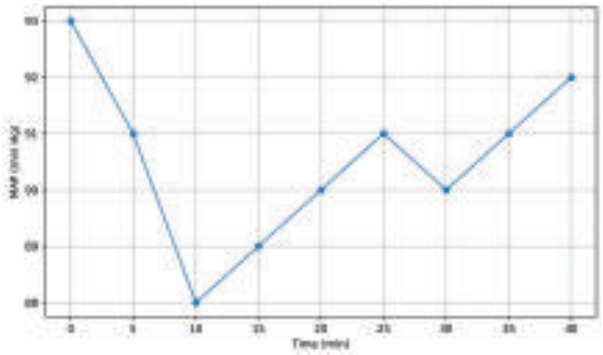

Figure 2: *Assessment of periprocedural MAP*

MAP remained relatively stable throughout the procedure, ranging from 88 ± 2.1 to 93 ± 2.3mm of Hg.

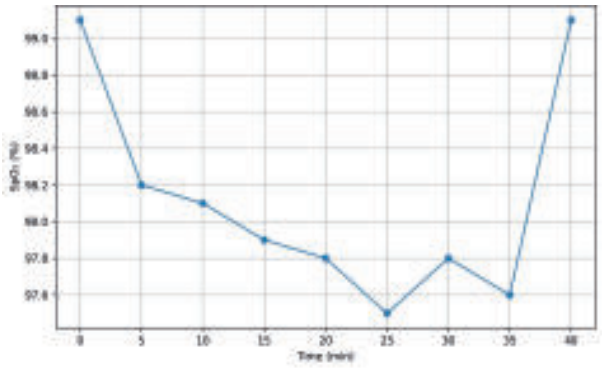

Figure 3: *Assessment of periprocedural SpO,*

Oxygen saturation remained within acceptable limits during the procedure. The lowest mean SpO, was 97.5 ± 1.9 at 25 minutes.

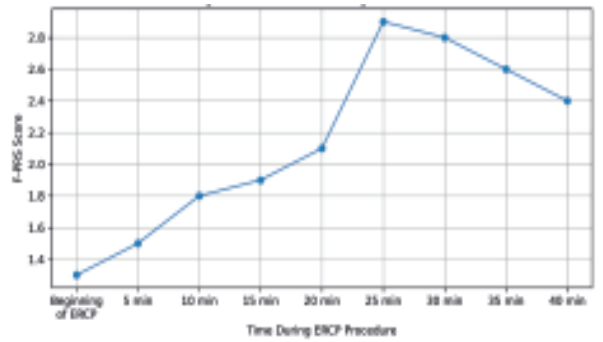

Figure 4: Assessment of periprocedural F-PRS score

Mean F-PRS score remained low throughout the procedure, ranging from 1.3 ± 0.2 to 2.9 ± 0.6, indicating minimal pain and minimal requirement of additional analgesia.

Table IV: *Assessment of total propofol consumption and total opioid consumption during ERCP*

Variables	Mean ± SD.
Total propofol consumption (mg)	75.5 ± 6.2
Total opioid consumption (ìg)	52.5 ± 6.7

Table V: Assessment of recovery time by Modified Aldrete's Score

Variables	Mean ± SD.
Recovery time ((Modified Aldrete's Score>9) (min)	5.65±1.45

After observing recovery time, mean recovery time after ERCP procedure was earlier estimated with Modified Aldrete's Score>9.

Discussion

This study was conducted in Department of Anaesthesia, Pain, Palliative and Intensive care Medicine, Dhaka Medical College and Hospital to assess the effectiveness of Dexmedetomidine as adjunct for sedation in patient undergoing ERCP.

In this study, onset of sedation in adjunct with dexmedetomidine was early and level of sedation (RSS) was more stable. RSS score did not frequently fall below level 4.

In a study by Pushkarna et al, patients had rapid onset of sedation in midazolam group but did not achieve the adequate depth of sedation as compared to dexmedetomidine group [20]. Probable cause may be method of administration IV bolus versus infusion.

In this study, it was observed that patient had comparatively lower HR throughout the procedure. After assessment of mean arterial pressure (MAP) during ERCP period, there had been no statistically significant difference in all over the point time. Dexmedetomidine causes activation of postsynaptic alpha 2 receptors leads to sympatholysis and results in hypotension and bradycardia.[21]

Muller et al, concluded that dexmedetomidine associated with higher hemodynamic instability.[22] This finding is different from our study. This difference may be due to high doses of dexmedetomidine, which was used solely during the entire procedure.

In other study, dexmedetomidine compared with midazolam and found that statistically significant lower heart rates in dexmedetomidine group compared with midazolam group. MAP was comparatively stable in dexmedetomidine group.[23,24]

In this study, on consideration of SpO, of the patients during ERCP period there had no statistically significant change of SpO, .

In a study by Sethi et al, there was also no statistically significant decrease in SpO, during the procedure when comparable in between two groups.[25] This study has concordance to our study result. Other study by Emad Salem et al, used dexmedetomidine during sedation of obstructive sleep apnea patients for upper gastro endoscopic procedures and concluded that dexmedetomidine can reduce the incidence of respiratory depression.[26]

In this study, after observing F-PRS throughout the procedure statistically significant difference was found at 20 min time of interval. Mean value of F-PRS was very low with dexmedetomidine, and the patients seldom need additional analgesia. Dexmedetomidine binds with alpha 2 receptors at dorsal horn of spinal cord and seems to employ analgesic effect.[27]

Another study found dexmedetomidine showed better F-PRS score. At 15 min of procedure, both groups that was dexmedetomidine and midazolam had similar F-PRS.[25]

In this study, total propofol requirement was less during the procedure. A synergistic effect was seen when these sedative drugs were used in combination with propofol. Mukhopadhyay et al, evaluated the efficacy of a dexmedetomidine as an add-on for prolonged deep sedation for ERCP and to compare three deep sedation regimens regarding safety and efficacy.[17] They concluded that the sedative and analgesic cocktail was superior to the conventional propofol-midazolam regimen, dexmedetomidine as add-on increased the

efficacy and safety of sedato-analgesic effect. It reduces propofol requirement, helps to maintain the patient a safe and stable level of sedation. Similar observation also found another study.[28]

In this study, observed that recovery time which was assessed by Modified Aldrete Score was faster adjunct with dexmedetomidine that was 5.65±1.45 min after ERCP procedure. Midazolam when used with propofol provide faster onset of sedation but did not produce quality sedation. So, need more incremental sedative and analgesic to maintain expected level of sedation, thus leads to prolong recovery time. The characteristic arousable sedation action of dexmedetomidine can be explained by its action on alpha 2 adrenoceptors in locus ceruleus in the brain stem.[20]

Similar observation also found by Tomer et al.[29] But another study showed recovery times between dexmedetomidine and midazolam were very similar[30]. The reason for this might be their duration of procedure relatively short compared to our study.

This study highlights that dexmedetomidine had a stable level of sedation, less chance of desaturation and rapid recovery time in patient undergoing ERCP. On the other hand, our study also suggests that adjunctive use of dexmedetomidine reduces propofol and fentanyl requirements and increase surgeon's satisfaction during ERCP.

Conclusion

This study supports the growing evidence that combining dexmedetomidine with propofol enhances the quality of moderate sedation for ERCP, improves patient stability, and may increase procedural efficiency. Larger randomized studies would help validate these findings and further define the optimal dosing strategy, but the present results reinforce the role of dexmedetomidine as an effective adjunct in gastrointestinal endoscopic sedation.

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