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Comparative Study On Effect Of Dexmedetomidine And Dexamethasone On Postoperative Nausea And Vomiting In Patients Undergoing Laparoscopic Cholecystectomy: A Parallel Group Randomised Clinical Trial.

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Abstract

Introduction: Laparoscopic cholecystectomy is the surgical treatment of choice for cholelithiasis but this procedure is associated with a high rate of postoperative nausea and vomiting (PONV).Nausea and vomiting are some of the most common complaints of patients after any anaesthesia, which is often associated with postoperative pain. ***Aims &objectives:*** Evaluation of effect of study drug on postoperative nausea and vomiting in laparoscopic cholecystectomy.Effect of study drug on postoperative analgesia. Effect of study drug on perioperative haemodynamic ***Materials & Methods:*** This study was designed as a single-blinded parallel group randomised clinical trial conducted in the New OT Complex, recovery room, and General Surgery Ward of COMJNMH, Kalyani. The study was carried out over a period of 1 year with a total sample size of 104 patients. ***Result:*** The mean postoperative nausea and vomiting (PONV) score was significantly lower in the Dexmedetomidine group compared to the Dexamethasone group. Patients receiving Dexamethasone had a mean nausea and vomiting score of 3.85 ± 0.66 (median: 4, range: 2–5), whereas those receiving Dexmedetomidine had a mean score of 2.81 ± 0.68 (median: 3, range: 1–4). This difference was highly statistically significant ($p < 0.0001$). ***Conclusion:*** We concluded that both Dexamethasone and Dexmedetomidine groups had comparable baseline diagnosis and comorbidity profiles, allowing a reliable comparison between the two groups. GB sludge was the most common diagnosis, followed by calculous cholecystitis and chronic cholecystitis, with no significant difference in diagnosis distribution.

Keywords: Dexmedetomidine, Dexamethasone, Postoperative nausea and vomiting, Laparoscopic cholecystectomy, Randomised clinical trial.

INTRODUCTION

The preferred surgical method for treating cholelithiasis is laparoscopic cholecystectomy; nevertheless, this procedure has a high rate of postoperative nausea and vomiting (PONV) [1].Following any anesthesia, patients frequently complain of nausea and vomiting, which are frequently linked to postoperative pain. Twenty to thirty percent of patients experience postoperative nausea and vomiting up to twenty-four hours after surgery. This could be because anesthetic medications affect the medulla oblongata's vomiting control area. Complications include aspiration pneumonia, ruptured abdomen, and airway obstruction can result from postoperative nausea and vomiting.

Dehydration, electrolyte imbalances, hypertension, suture straining, increased bleeding from skin flaps, and delayed discharge are all consequences of postoperative vomiting. If the lingering effects of anesthetic medications diminish airway reflexes, this consequence may raise the risk of pulmonary aspiration [2].Dopamine and serotonin receptor antagonists, corticosteroids, antihistamines, sedatives, and anticholinergics are among the medications that have been utilized to treat this illness thus far. Metoclopramide and Droperidol are the most widely used medications to treat nausea and vomiting. These agents have been limited in certain cases due to complications like fatigue and restlessness, lack of awareness of time and place, extra pyramidal symptoms, cardiovascular complications, hypotension, orthostatic hypotension, drowsiness, akathisia, elevated liver enzymes, and agranulocytosis [3].

Drug therapy and complementary therapies, which can be used alone or in conjunction with conventional treatments, have now taken the place of the aforementioned medications [4]. Because of its anxiolytic, sedative, analgesic, sympatholytic, and hemodynamic regulating effects, dexmedetomidine, a strong alpha-2-adrenergic receptor agonist, has been used extensively [5]. One corticosteroid medication that lowers inflammation and impairs immunity is dexamethasone. Dexamethasone is a readily available and inexpensive medication used to manage nausea and vomiting following surgery. Dexamethasone's anti-nausea and anti-vomiting properties have been demonstrated in chemotherapy patients over the past 20 years. Evaluation of effect of study drug on postoperative nausea and vomiting in laparoscopic cholecystectomy. Effect of study drug on postoperative analgesia. Effect of study drug on perioperative haemodynamic.

MATERIALS AND METHODS

Type of Study: A single blinded parallel group randomised clinical trial

Place of Study: New OT Complex, recovery room and General surgery ward COMJNMH, Kalyani

Study Duration: 1 year

Sample Size: 104

Inclusion Criteria:

- Patients who have given written informed consent
- Age : 18-65 years
- ASA grade : I and II
- Body Mass Index(BMI) ≤ 35
- Body Weight ≥ 50kg
- Patients of all gender undergoing elective laparoscopic cholecystectomy.

Exclusion Criteria:

- History of drug abuse
- Pregnancy
- History of allergy /known contraindication to the drugs used in study.
- Patient who cannot communicate,understand and follow commands due to any reason.
- History of Gastroparesis, Gastro oesophageal reflux disorder.
- Any additional confounding factors that itself may lead to PONV.
- Any patient who decides to opt out from study at any point of time.

Study Variables:

- Postoperative nausea and vomiting (PONV) score
- Incidence of postoperative nausea
- Incidence of postoperative vomiting
- Requirement of rescue antiemetic medication
- Dose of rescue antiemetic required
- Time to first requirement of rescue antiemetic
- Time interval for rescue analgesia requirement
- Postoperative pain assessment score
- Patient recovery profile after surgery

Statistical Analysis:

Data were entered into Excel and subsequently analyzed using SPSS and GraphPad Prism. Continuous variables were summarized as means with standard deviations, while categorical variables were presented as counts and percentages. Comparisons between independent groups were performed using two-sample t-tests, and paired t-tests were applied for correlated (paired) data. Categorical data were compared using chi-square tests, with Fisher's exact test applied when expected cell counts were small. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

Table 1: Association between Diagnoses

	Diagnosis	Dexamethasone	Dexmedetomidine	Total	p-value
Diagnosis	**Calculous Cholecystitis**	16 (31.4)	20 (37.7)	36 (34.6)	0.7558
	Chronic Cholecystitis	14 (27.5)	12 (22.6)	26 (25.0)	
	GB Sludge	21 (41.2)	21 (39.6)	42 (40.4)	
	Total	51 (100.0)	53 (100.0)	104 (100.0)	
Comorbidity	**Hypertension**	1 (2.0)	4 (7.5)	5 (4.8)	0.183
	Nil	50 (98.0)	49 (92.5)	99 (95.2)	
	Total	51 (100.0)	53 (100.0)	104 (100.0)	

Table 2: Association between ASA

ASA Grade	Dexamethasone	Dexmedetomidine	Total	p-value
Grade 1	48 (94.1)	35 (66.0)	83 (79.8)	0.0003
Grade 2	3 (5.9)	18 (34.0)	21 (20.2)	
Total	51 (100.0)	53 (100.0)	104 (100.0)	

Table 3: Distribution of mean Nausea Vomiting Score

		Number	Mean	SD	Minimum	Maximum	Median	P-value
Nausea Vomiting Score	DEXAMETHASONE	27	3.8519	0.6624	2	5	4	<0.0001
	DEXMEDETOMIDINE	27	2.8148	0.6815	1	4	3	

Table 4: Distribution of mean Rescue Antiemetic Dose (mg)

		Number	Mean	SD	Minimum	Maximum	Median	P-value
RESCUE ANTIEMETIC DOSE(mg)	DEXAMETHASONE	27	4.7457	1.9314	0	8	4	0.0039
	DEXMEDETOMIDINE	27	5.1953	1.8213	4	8	4	

Table 5: Distribution of mean Time Gap Post -OP for Rescue Analgesia (mins):

		Number	Mean	SD	Minimum	Maximum	Median	P-value
TIME GAP POST -OP FOR RESCUE ANALGESIA TIME GAP (mins)	DEXAMETHASONE	27	457.1481	177.3531	179.0000	720.0000	480.0000	0.0034
	DEXMEDETOMIDINE	27	430.5185	170.3990	149.0000	690.0000	480.0000	

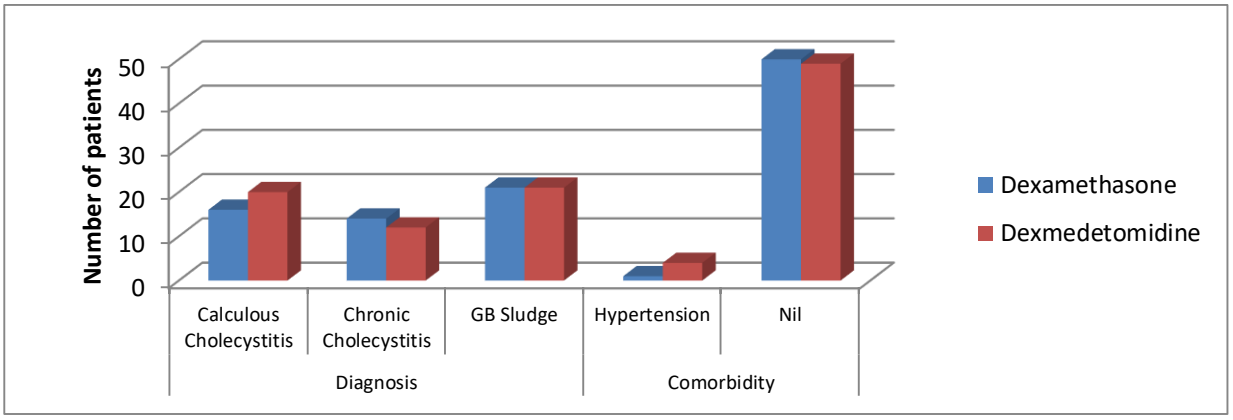

Figure 1: Association between Diagnoses

The distribution of baseline diagnosis and comorbidity was comparable between the Dexamethasone and Dexmedetomidine groups. Overall, GB sludge was the most common diagnosis, observed in 42 (40.4%) patients, followed by calculous cholecystitis in 36 (34.6%) and chronic cholecystitis in 26 (25.0%) patients. In the Dexamethasone group, GB sludge, calculous cholecystitis, and chronic cholecystitis were present in 21 (41.2%), 16 (31.4%), and 14 (27.5%) patients, respectively, while in the Dexmedetomidine group, the corresponding frequencies were 21 (39.6%), 20 (37.7%), and 12 (22.6%). The difference in diagnosis distribution between the two groups was not statistically significant ($p = 0.7558$). Regarding comorbidity, the majority of patients had no associated comorbidity (99; 95.2%), whereas hypertension was present in only 5 (4.8%) patients, including 1 (2.0%) in the Dexamethasone group and 4 (7.5%) in the Dexmedetomidine group.

The difference in comorbidity distribution was also not statistically significant ($p = 0.183$). The distribution of ASA grades differed significantly between the Dexamethasone and Dexmedetomidine groups. Overall, 83 (79.8%) patients were classified as ASA Grade 1, while 21 (20.2%) were classified as ASA Grade 2. In the Dexamethasone group, 48 (94.1%) patients were ASA Grade 1 and 3 (5.9%) were ASA Grade 2, whereas in the Dexmedetomidine group, 35 (66.0%) patients were ASA Grade 1 and 18 (34.0%) were ASA Grade 2. The difference in the distribution of ASA grades between the two groups was statistically significant ($p = 0.0003$). The mean postoperative nausea and vomiting (PONV) score was significantly lower in the Dexmedetomidine group compared to the Dexamethasone group. Patients receiving Dexamethasone had a mean nausea and vomiting score of 3.85 ± 0.66 (median: 4, range: 2–5), whereas those receiving Dexmedetomidine had a mean score of 2.81 ± 0.68 (median: 3, range: 1–4). This difference was highly statistically significant ($p < 0.0001$).

The requirement of rescue antiemetic dose was significantly different between the Dexamethasone and Dexmedetomidine groups. The mean rescue antiemetic dose in the Dexamethasone group was 4.75 ± 1.93 mg (median: 4 mg, range: 0–8 mg), whereas in the Dexmedetomidine group, the mean dose was 5.20 ± 1.82 mg (median: 4 mg, range: 4–8 mg). The difference between the two groups was statistically significant ($p = 0.0039$). The time interval for requirement of rescue analgesia was compared between the Dexamethasone and Dexmedetomidine groups. The mean time gap for rescue analgesia requirement in the Dexamethasone group was 457.15 ± 177.35 minutes (median: 480 minutes, range: 179–720 minutes), whereas in the Dexmedetomidine group, it was 430.52 ± 170.40 minutes (median: 480 minutes, range: 149–690 minutes). The difference between the two groups was statistically significant ($p = 0.0034$).

DISCUSSION

Postoperative nausea and vomiting (PONV) remains one of the most frequent complications following laparoscopic cholecystectomy and continues to impact patient comfort and recovery. In the present randomized parallel group clinical trial, dexmedetomidine demonstrated a significantly lower postoperative nausea and vomiting score compared to dexamethasone (2.81 ± 0.68 vs 3.85 ± 0.66; $p < 0.0001$), indicating superior antiemetic efficacy. The baseline distribution of diagnosis and comorbidities was comparable between both groups. Gall bladder sludge was the most common indication for surgery, followed by calculous cholecystitis and chronic cholecystitis. Similar distributions have been reported by Rajpoot K et al. (2025) and 2. Lady Aqnes Kurniawati L et al. (2021), who observed that symptomatic cholelithiasis and chronic inflammatory gall bladder disease remain the leading indications for laparoscopic cholecystectomy in tertiary care settings [6,7].

This comparability ensures minimal selection bias between the study groups. In the present study, ASA grade distribution showed a statistically significant difference between groups, with a higher proportion of ASA Grade II patients in the

dexmedetomidine group. However, despite this imbalance, dexmedetomidine still demonstrated better PONV control. This finding supports the robustness of its antiemetic effect across varying perioperative risk profiles. Dexmedetomidine, a selective α2-adrenergic agonist, exerts sedative, anxiolytic, and analgesic effects while reducing sympathetic outflow and perioperative opioid requirements, thereby indirectly decreasing PONV incidence. Similar findings were reported by Jin Z et al. (2018), who demonstrated reduced PONV and improved hemodynamic stability with dexmedetomidine infusion during laparoscopic surgeries [8].

Dexamethasone, a corticosteroid with anti-inflammatory and central antiemetic effects, is widely used for PONV prophylaxis. However, in the present study, dexmedetomidine showed superior efficacy. Comparable observations were made by Gianturco SL et al. (2021), who reported that dexmedetomidine provided better control of postoperative nausea compared to dexamethasone in laparoscopic procedures, likely due to its opioid-sparing properties [9]. The requirement of rescue antiemetic medication was significantly different between groups ($p = 0.0039$), with better outcomes observed in the dexmedetomidine group. In terms of postoperative analgesia, the time interval for rescue analgesia was significantly different between groups. Dexmedetomidine showed a more favorable analgesic profile, consistent with its central α2-mediated analgesic mechanism. BATOOL S et al. (2024) also reported prolonged postoperative analgesia and reduced opioid consumption with dexmedetomidine in laparoscopic cholecystectomy patients [10]. The superior efficacy of dexmedetomidine observed in this study may be attributed to its multimodal pharmacological actions, including inhibition of sympathetic activity, reduction of stress response, and opioid-sparing effects, all of which contribute to lower PONV incidence and improved recovery outcomes.

CONCLUSION

We concluded that both Dexamethasone and Dexmedetomidine groups had comparable baseline diagnosis and comorbidity profiles, allowing a reliable comparison between the two groups. GB sludge was the most common diagnosis, followed by calculous cholecystitis and chronic cholecystitis, with no significant difference in diagnosis distribution. The majority of patients had no associated comorbidity, and although ASA grade distribution differed significantly, most patients in both groups were classified as ASA Grade 1. Dexmedetomidine was found to be more effective in reducing postoperative nausea and vomiting, as evidenced by significantly lower PONV scores compared with Dexamethasone. A significant difference was also observed in rescue antiemetic requirement and postoperative analgesic parameters between the groups. Overall, Dexmedetomidine showed better postoperative outcomes by improving PONV control and affecting postoperative analgesic requirements in patients undergoing laparoscopic cholecystectomy. Hence, Dexmedetomidine may be considered a beneficial perioperative adjunct for enhancing postoperative recovery and patient comfort.

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