Oxycodone versus Morphine for Post-operative Analgesia in Patients Undergoing Laparoscopic Cholecystectomy

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ORIGINAL ARTICLE

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Abstract

Background: One of the common causes studied cases that seek medical attention after laparoscopic surgery is visceral pain. Opioids are commonly used analgesics for postoperative visceral pain because they can be utilized either before and after surgery in a patient-controlled analgesia pump.

Aim: Intravenous oxycodone versus morphine after laparoscopic cholecystectomy on postoperative pain: The primary result is to compare the impacts of the severity of postoperative pain using the visual analog scale (VAS) score. The secondary outcomes are to compare the occurrence of postoperative nausea, and vomiting, impact on heart rate (HR), and length of hospital stay.

Patients and techniques: This study was prospective, single-blinded, and controlled randomized research conducted at Al-Azhar University Hospitals, Following the patient's informed consent, 50 patients undergoing laparoscopic cholecystectomy creation of the following criteria were conducted for this study from April 2022 to October 2022.

Results: A 0−10 visual analog scale was utilized to measure the postoperative pain was larger in the Morphine group compared with oxycodone group with P value less than 0.05. Also, there was a decreased need for postoperative analgesia among the oxycodone group.

Conclusion: Oxycodone has a good postoperative analgesic effect with less need for postoperative analgesia, which can be a good alternative to Morphine.

Keywords: Cholecystectomy, Laparoscopic, Morphine, Oxycodone

1. Introduction

One of the common causes studied cases that seek medical attention after laparoscopic surgery is visceral pain[1].

Over the last several years, laparoscopic surgery has grown steadily, transitioning from an intrusive diagnostic tool to an effective tool for surgically treating benign and malignant illnesses. Faster healing, shorter hospital stays, and a speedier return to normal activities are some of laparoscopic surgery's most evident advantages. Reduced frequency of wound infections was the result and efficiency. Opioids are commonly used analgesics for postoperative visceral pain because they can be utilized either before and after surgery in a patient-controlled analgesia pump. Even so, which type of opioid is appropriate remains debatable[1].

In immediate postoperative duration, intravenous (IV) analgesia has distinct benefits[2].

Faster healing, shorter hospital stays, and a speedier return to normal activities are some of laparoscopic surgery's most evident advantages. A variety of applications, including cholecystectomy, fundoplication, and adrenalectomy, have shown effectiveness, lower prevalence of wound infections,

and decreased perioperative morbidity of minimally invasive operations. There is currently no proof that open surgery yields better oncological short-and long-term outcomes than laparoscopic surgeries.[3]

In addition to being impacted by physiologic, sensory, affective, cognitive, sociocultural, and behavioral aspects, pain is defined as a complex of sensory and emotional experiences.[4]

Because it is less invasive and time-consuming than more sophisticated laparoscopic operations, laparoscopic cholecystectomy was selected as the model technique. it became the routine role for cholecystectomy and some considered it as a day surgery.[5]

Even though it is far less than the pain experienced after an open cholecystectomy, the discomfort after a laparoscopic procedure is nevertheless regarded as severe. The use of various pain management methods, such as the administration of intraperitoneal local anesthetics, is controversial.[6]

Although it has been shown that intraperitoneal local anesthetics are effective for treating shoulder and stomach pain, some research contradicts this conclusion.[7]

This Work's main goal is to compare the impacts of the severity of postoperative pain using visual analog scale (VAS) score. The secondary outcomes are to compare occurrence of postoperative nausea, and vomiting, impact on HR, and length of hospital stay.

2. Patients and methods

After receiving departmental and institutional ethics committee permission, this research was done at Al-Azhar University Hospitals in a prospective, double-blinded, controlled, and randomized manner. Following patients informed consent, 50 patients undergoing laparoscopic cholecystectomy creation of the following criteria were conducted for this study from April 2022 to October 2022.

2.1. Inclusion criteria

Elective laparoscopic cholecystectomy, Age: 21—50 years old, Sex: both, American Society of Anesthesia groups I-II, body mass index 18—35, and Communicable.

2.2. Exclusion criteria

Allergies to local anesthetics, drug abuse, patients on medications that may alter pain excerption, patients who have any neurological condition that may alter proper communication, patients who are morbidly obese with BMI greater than 35, patients having hepato-splenomegaly and any hepatic disease, patients whose laparoscopic process will be converted to open cholecystectomy for any reason and patients had prolonged stay more than 24 h will be excluded from research.

2.3. Study groups

All studied cases meeting inclusion criteria were haphazard. Assigned to 1 of 2 groups, 25 per each group: group M (25 patients): 10 mg morphine will be diluted to 10 in a 10 ml syringe and given 0.1 mg/kg morphine intravenously after clipping the cystic artery and group O (25 patients): 10 mg oxycodone will be diluted to 10 in 10 ml syringe and given 0.1 mg/kg oxycodone intravenous after clipping the cystic artery.

2.3.1. Randomization

Studied cases were haphazardly allocated by a computer-generated table into two groups.

2.3.2. Preoperative assessment and preparation

Before the procedure, a thorough history of the patient's physical condition, concurrent medical issues, current medicines, food allergies, and prior surgical and anesthetic experience will be obtained. After that, they will be evaluated clinically and by laboratory tests including electrolytes, the complete blood count, prothrombin time, and activity of liver, kidney, and electrolyte.

2.3.3. Anesthetic technique

Preoperative settings: detailed history taking: years old, sex, and existence of parental consanguinity, assessment of weight, height, arterial blood pressure, and other vital signs. Vital data such as temperature, heart rate, respiratory rate and blood pressure were recognized.

Intraoperative settings: The operation room was set between 21 and 22 °C. Irrigation and versus Following anesthesia induction with intravenous (IV) propofol 2 mg/kg and fentanyl 2 μg/kg and atraciurium 0.45 mg/kg, basic monitoring such as pulse oximetry, electrocardiography, and noninvasive blood pressure measurement was attached. Mechanical ventilation was started after endotracheal intubation to maintain anesthesia. Sevoflurane 2—2.5% was used, and CO_2 gas had been inflated by the infraumbilical V needle. Abdominal insufflation pressure is sated at 12—14 mmHg and after clipping of the cystic artery; patients will be divided into two. Group M (25 patients): 10 mg morphine was diluted to 10 in a 10 ml syringe and given 0.1 mg/kg morphine intravenous after clipping the cystic

artery and group O (25 patients): 10 mg oxycodone was diluted to 10 in 10 ml syringe and given 0.1 mg/kg oxycodone intravenous after clipping the cystic artery, all processes were carried out by the same surgeons, laparoscopic cholecystectomy was done through three abdominal ports, at end of the surgery, sevoflurane was discontinued, and fresh gas flow had been raised to 7 l/min, to reverse residual neuromuscular blockade, IV neostigmine 0.04–0.08 mg/kg plus atropine 0.01 mg/kg was injected after checking train-of-4 count greater than 2 using nerve stimulator and after confirming adequate tidal volume oral suction was gently performed and smooth tracheal extubation was done. The studied cases had been transferred to post-anesthesia care unit.

Postoperative settings: after studied case was discharged from the operating room the following data should be collected.

2.3.4. Postoperative pain scores

The patients will be instructed on the use of the VAS. Scores were based on self-reported symptoms that were recorded with a single handwritten mark put at a location along a 10 cm line that represents a continuum between two ends of the scale: 'no pain' on the left end (zero cm) of the scale and 'worst agony' on the right end (zero cm) (10 cm). The level of pain will be measured at 5 points: immediately after surgery, 2, 6, 12, 18, and 24 h later.

2.3.5. Measurement of postoperative consumption of rescue analgesia

Ketorolac 30 mg will be given intravenous for patients of both groups as a rescue analgesic if needed postoperative according to VAS score greater than 4 at 2, 4, 8, 12 h.

2.3.6. Nausea

Will be recorded as YES or NO and it will be assessed immediately after recovery and at 2, 6, 12, 18, and 24 h.

2.3.7. Vomiting

Will be recorded as YES or NO and it will be assessed immediately after recovery and at 2, 6, 12, 18, and 24 h.

Respiratory rate and oxygen saturation: (SPO_2%) will be recorded immediately after recovery and at 2, 6, 12, 18, and 24 h.

2.3.8. Haemodynamic data like HR and MAP

Will be noted intraoperatively and postoperatively at baseline before skin incision 30, 60, 90, 120 min 6, 12, 18, 24 h.

2.4. Statistical analysis

Statistical Program for Social Science version 20 was used to analyze data. Mean and standard deviation was used to define quantitative variables (SD). Numbers and percentages were used to define qualitative variables. The Student t-test was utilized to compare parametric quantitative values between two groups. When the frequency was less than 5, qualitative variables had been compared utilizing χ^2 test and Fisher's exact test.

2.4.1. Sample size justification

Sample size calculation, setting power at 80% and α-error at 0.05 and based on 'Silvasti et al., 1998',[8] the expected mean VAS postoperative in oxycodone group = 15 ± 6.67 and in morphine group = 10 ± 4.67.

3. Results

The present study revealed nonsignificant comparison between the two groups regarding age and sex distribution (P value > 0.05), as shown in (Table 1, Figs. 1 and 2).

This study revealed higher degrees of VAS score in group M, compared with group O, immediately after surgery and at 2-, 6-, and 12 h postoperatively ($P < 0.05$). At 24 h postoperatively, no variation was found among groups regarding pain scores ($P = 1.000$) as found in (Table 2).

In group M, 16 (64%) patients were ASA grade I, and 9 (36%) patients were ASA grade II (Fig. 3a). In group O, 14 (56%) patients were ASA grade I, while 11 (44%) were ASA grade II (Fig. 3b).

As demonstrated in Table 3, no variation was shown between groups concerning baseline heart rate or heart rate at 15 min, 30 min, 60 min, 120 min, 6 h, 12 h, 18 h, and 24 h ($P > 0.05$).

As confirmed in Table 4, no variation was found among groups concerning baseline MAP or MAP at

Table 1. Comparison of the demographic information between the two groups.

	Group M (N = 25)	Group O (N = 25)	P value
Age, years			0.209[a]
Mean ± SD	35.8 ± 9.1	32.6 ± 8.5	
Range	21–50	21–49	
Sex			0.395[b]
Female	12 (48%)	15 (60%)	
Male	13 (52%)	10 (40%)	

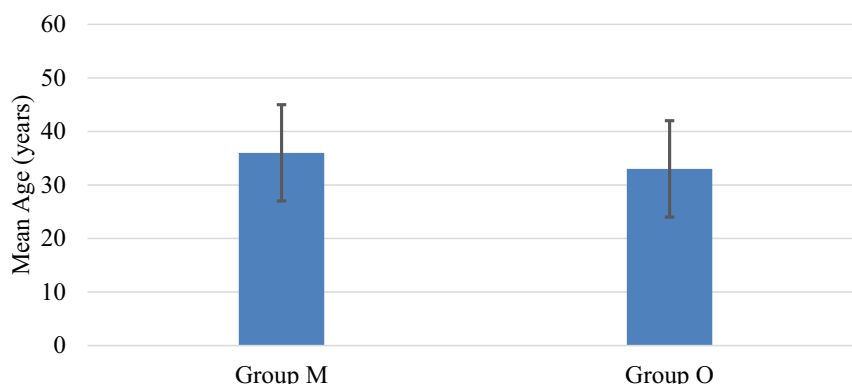[a] Independent sample t-test.
[b] χ^2 test.
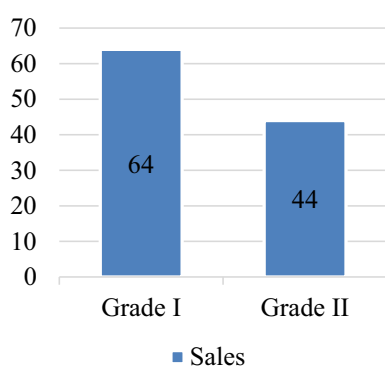
Fig. 1. Age distribution.
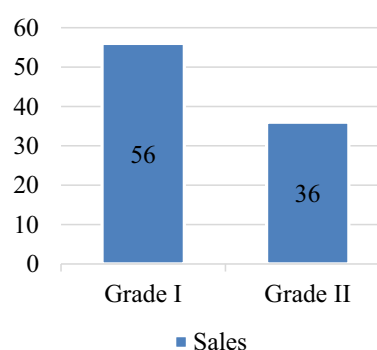

Fig. 2. a. ASA (Group O).

Fig. 3. a. ASA (Group M).

15 min, 30 min, 60 min, 120 min, 6 h, 12 h, 18 h, and 24 h ($P > 0.05$).

4. Discussion

Most surgical studied cases experience acute postoperative pain, with more than eighty percent reporting moderate-to-severe pain Apfelbaum.[8] Acute postoperative pain has multiple mechanisms and can include both nociceptive and neuropathic pain Gupta.[9] Effective pain management is therefore essential to postoperative recovery and can help enhance studied case comfort and tissue healing Rawal.[10]

Intravenous analgesia is commonly used in early postoperative duration Gurney.[11] In cases of moderately severe to severe acute postoperative

Table 2. Comparing among study groups concerning VAS SCORE.

	Group M (N = 25)		Group O (N = 25)		P value
	Mean	SD	Mean	SD	
VAS for Pain					
Postoperative	1.4	1.1	0.7	0.8	0.013[a]
2 h	2.5	1.3	1.9	0.8	0.023[a]
6 h	4.2	1.8	3.3	0.7	0.036[a]
12 h	5.1	1.9	3.9	0.6	0.001[b]
24 h	4.9	1.5	4.9	8.1	1.000
Duration to the first request of analgesia (minutes)	288	57	364	42	0.001[b]

Using: t-Independent Sample t-test.
Data are represented as mean ± SD P value greater than 0.05 NS.
[a] P-value less than 0.05 S.
[b] P-value less than 0.001 HS.

Table 3. Comparing the study groups regarding heart rate.

	Group M (N = 25)		Group O (N = 25)		P value
	Mean	SD	Mean	SD	
Baseline	75	6.4	70	6.1	0.205
15 min	68	6.6	65	6.4	0.259
30 min	60	6.4	67	6.7	0.238
60 min	65	6.4	70	6.5	0.181
120 min	62	6.5	75	6.6	0.268
6 h	65	6.5	75	6.5	0.243
12 h	60	6.5	89	6.2	0.251
18 h	70	6.4	90	6.6	0.236
24 h	80	6.3	90	6.5	0.912

Using: t-Independent Sample t-test.
Data are represented as mean ± SD.
P value greater than 0.05 NS.

Table 4. Comparing among study groups regarding mean arterial pressure.

	Morphine (N = 25)		Oxycodone (N = 25)		
	Mean	SD	Mean	SD	P value
Baseline	95	9.5	93	8.6	0.475
15 min	90	9.4	88	9.1	0.648
30 min	87	9.6	85	9.5	0.266
60 min	91	9.5	89	8.9	0.496
120 min	92	9.8	90	9.0	0.591
6 h	92	9.7	91	9.8	0.694
12 h	90	9.6	89	9.6	0.715
18 h	94	9.5	92	8.6	0.671
24 h	89	9.2	93	8.8	0.108

Using: a t-Independent Sample t-test.
Data are represented as mean ± SD.
P value greater than 0.05 NS.

pain, clinical practice standards advise using opioids as part of a multimodal analgesic approach Raff.[12]

According to the current study, 0.1 mg/kg oxycodone and morphine had been given intravenously at end of anesthesia, and during 4 h postoperative study duration, pain medications had been oxycodone and morphine 0.1 mg/kg intravenously. When studied cases arrived in the recovery room after the operation, the requirement for analgesics was assessed. Following that, pain score and side effects were documented every 15 min. When administered intravenously, these 2 opioids are thought to be equipotent. When studied cases arrived in the recovery room after the operation, the requirement for analgesics was assessed. A 0–10 VAS was used to measure postoperative discomfort. was larger in Morphine group compared with oxycodone group with P value less than 0.05. Also, there had been a decreased need for postoperative analgesia among the oxycodone group with a P value less than 0.001 Apfelbaum.[8]

In agreement with Lenz et al. study was conducted on 91 women who received IV oxycodone and morphine before end of laparoscopic hysterectomy and then continued with studied case controlled analgesia for 24 h postoperatively and discovered that Mean VAS at rest at first PCA request was similar among groups, 53 mm in group O and 54 mm in group M (P = 0.71), however, mean duration from emergence to first use of PCA was different, mean 20 min in group O and 16 min in group M (P = 0.038). Accumulated 24 h oxycodone consumption had been less than accumulated morphine consumption (13.3 ± 10.4 mg vs. 22.0 ± 13.1 mg, P = 0.001), resulting in lower VAS score and less sedation with oxycodone (P value = 0.006) Lenz.[13]

In another metanalysis by Li et al. research, analgesic efficacy and adverse events of oxycodone and other opioids, such as alfentanil, sufentanyl, fentanyl, and morphine, were studied in the treatment of postlaparoscopic surgery visceral pain. It was discovered that analgesic impact of oxycodone is superior to that of other opioids such as morphine and fentanyl after 4 h and 24 h Li.[14]

In contrast, another study by Bialka et al. was conducted on patients scheduled for elective thoracotomy. The TEA group was given continuous thoracic epidural analgesias as technique of postoperative pain management, while the morphine group was given morphine IVPCA and the morphine group was given oxycodone IVPCA. Hemodynamic parameters, pain level, sedation, and requirement for rescue analgesia were all monitored for f48 h. After 48 h, studied cases had been asked about their satisfaction with pain therapy using the Likert scale, and our research group concluded that TEA provided superior anesthesia compared with PCA.[15]

Zhao et al. performed research to compare effectiveness and side effects of oxycodone and morphine in management of postoperative pain by titration in patients who underwent laparoscopic gynecologic. 30 adult female patients were scheduled for elective laparoscopic gynecologic surgery under general anesthesia. All studied cases had been given an intravenous PEG nanometer drug delivery system. Furthermore, when they arrived at the postanesthesia care unit (PACU), VAS score was utilized to assess postoperative pain. Also, studied cases were given 3 mg oxycodone or morphine for titration when the pain VAS score was more than 30 mm, and the pain and sedation scores were re-evaluated after 5 min The titration stopped if the VAS score was less than or equal to 30 mm otherwise the titration continued as per the above method until the VAS score was less than 30 mm. The required titration dosage, times, and time of oxycodone titration were noted and they were all remarkably lower than those of morphine titration group (P < 0.05) Zhao.[16]

Another study by Kim et al. was conducted on sixty studied cases that had been randomized for postoperative pain therapy with either oxycodone (n = 30) versus fentanyl (n = 30) groups, similar to our study, oxycodone had a significantly lower postoperative pain score, with the same incidence of adverse reactions as nausea.[17]

In agreement with Kim et al. study that was performed on patients was randomized for postoperative pain including the oxycodone group and fentanyl group including fentanyl-added ketorolac and found that the oxycodone group had lower postoperative pain assessed by NRS score, but postoperative side effects including nausea, vomiting, dizziness, and

drowsiness were greater in oxycodone group, also patient satisfaction was greater among oxycodone group compared with fentanyl group Kim.[18]

Also, D' Amato and colleagues[19] conducted a study on 106 patients for total hip replacement. Prior to surgery, all patients had combination spinal-epidural anesthesia with intrathecal injections of chirocaine 0,25% 7 mg and epidural injections of chirocaine 0,75% 40 mg, morphine 2, and atropine 0,13 mg.

Following surgery, patients received 100 mg of tapentadol twice daily for 4 days (after which they were typically discharged); in contrast, patients in the control group received oxycodone/naloxone 10 mg/5 mg twice daily per os; both therapies were given in conjunction with 100 mg of ketoprofen twice daily (Sanchez de Aguila et al., 2015). The rescue dosage for all groups was 1 g of paracetamol for NRS less than 3 and 0.1 mg/kg SC of morphine for NRS greater than 3. Before inducing anesthesia, a standard prophylaxis was carried out for the management of postoperative nausea and vomiting (PONV) by administering 4 mg of ondasentron, 10 mg of metochlopramide, 125 mg of methylpred-nisolone, and 50 mg of ranitidin diluted in 500 ml of saline solution or ringer acetate intravenously.

In the post-op period, the patient requested further doses of 4 mg ondansetron IV if necessary. first endpoint Statistics showed that all intergroup varia-tions were substantial ($P < 0.001$). Regarding NRS modifications, pain was significantly greater in the control group on all 4 days ($P < 0.001$). NRS at rest increased in the tapentadol group from 0.5 on T1 to 0.6 on T2, dropped, and stayed steady at 0.5 until T4. NRS in the control group, on the other hand, began at 1.4 on T1, grew slightly to 1.5 on T2, then declined to 1.3 on T3, and 1.2 on T4 DAmato and colleagues.[19]

4.1. Conclusion

Oxycodone has a good postoperative analgesic effect with less need for postoperative analgesia, which can be a good alternative to Morphine.

Disclosure

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Conflicts of interest

The authors declared that there were No conflicts of Interest.

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