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# COMPARATIVE ASSESSMENT OF ANALGESIC EFFICACY OF INTERPERITONEAL BUPIVACAINE ALONE VS COMBINED BUPIVACAINE AND DEXAMETHASONE IN ABDOMINAL SURGERY

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## ABSTRACT

**Background**: Acute discomfort has been linked to laparoscopic cholecystectomy, and many techniques have been employed to reduce postoperative pain after laparoscopy.

**Aim**: After laparoscopic cholecystectomy, the current study aimed to assess the analgesic efficacy of bupivacaine alone against bupivacaine plus dexamethasone.

**Methods**: For this study, 42 patients who underwent laparoscopic cholecystectomy were assessed. Group I of the patients received 40 milliliters of 0.25% bupivacaine and 16 milligrams of dexamethasone intraperitoneally, while Group II received 40 milliliters of bupivacaine alone. The patients were divided into two groups of 21. We compared the VAS ratings of the two groups, the time taken to take the first analgesic, and the total amount of rescue analgesic.

**Results**: Group I needed a first rescue analgesic more quickly than Group II (417.3±276.2 min versus 219.6±226.3 min, p=0.001). Group I's total rescue analgesic intake was substantially less than Group II's, at 60.73±29.82 mg and 73.22±11.55 mg, respectively, with a p-value of less than 0.01. Additionally, until two hours after surgery, Group I's VAS ratings were lower than Group II's, with a mean difference of -1.0 and $p<0.001$.

**Conclusion**: The intraperitoneal injection of a combination of 16 mg dexamethasone and 0.25% bupivacaine significantly reduces postoperative pain and the need for rescue analgesics following laparoscopic cholecystectomy, as compared to 0.25% bupivacaine alone.

**Keywords**: dexamethasone, cholecystectomy, analgesia, and laparoscopy

## INTRODUCTION

Because laparoscopy has so many advantages over exploratory approaches, it is currently the procedure of choice for many surgical and diagnostic procedures. These benefits include quicker return to normal activities following surgery, a shorter stay in the hospital afterward, an earlier recuperation period, and improved cosmetic outcomes. Furthermore, compared to laparotomies, laparoscopic procedures result in less discomfort overall. However, the pain following a laparoscopy is intense, requiring more frequent use of analgesics and lengthier hospital stays.2. A comprehensive assessment of post-laparotomy pain management strategies has been completed previously. These methods involve injecting local anesthetics intraperitoneally, either alone or in combination with additional drugs such steroids, dexmedetomidine, morphine, analgesic patches, and/or intravenous medicines.3

The administration of intraperitoneal local anesthetic has been frequently used for postoperative analgesia after laparoscopy.4 Intraperitoneal injections are used for local anesthetics as ropivacaine, bupivacaine, and lidocaine. Per studies, dexamethasone given as a single dosage has demonstrated efficacy as an analgesic after gynecological laparoscopic procedures.5. The goal of the current clinical experiment was to evaluate the analgesic efficacy of bupivacaine alone versus bupivacaine plus dexamethasone after laparoscopic cholecystectomy.

Another objective of the study was to compare the rates of hyperglycemia, vomiting, postoperative nausea, need for the full dosage of rescue analgesics, and time for initial administration of rescue analgesics between the two groups. The present clinical investigation aimed to assess the analgesic efficacy of bupivacaine in isolation versus bupivacaine in combination with dexamethasone after laparoscopic cholecystectomy.

The incidence of postoperative nausea and vomiting, hyperglycemia, the need for a complete dosage of rescue analgesics, and the amount of time until first using rescue analgesics were other objectives of the research. The study was conducted following permission by the appropriate institutional ethical committee. Each participant provided both written and verbal informed consent before to the study's start. After the qualifying requirements for the study were evaluated, research participants undergoing laparoscopic cholecystectomy were included. Following the final appraisal for inclusion, each subject was given a comprehensive description of the research strategy. Laparoscopic cholecystectomy was performed on 42 patients with ASA (American Society of Anesthesiologists) status I and II, spanning age groups from 18 to 60. Exclusions from the investigation included subjects with a history of abdominal surgery, pregnant women, people taking steroids, people allergic to the study medicines, and people with diabetes mellitus.

Finally, two groups of twenty-one participants each were created at random from the 42 participants. After being finally included in the study, baseline blood sugar levels, Apfel risk scores, demographic data, and postoperative nausea and vomiting were recorded for each research participant.

A visual analog scale (VAS) with 10 points for pain intensity—0 representing no pain and 10 representing the severe agony—was used to brief each subject. On the day of operation, regular monitors were put up and peripheral venous access was gained. All participants underwent endotracheal intubation for general anesthesia, and they were given intravenous fentanyl at a dose of 2 µg/kg, 0.1 mg/kg of vecuronium, and 2-2.5 mg/kg of propofol. When the baseline systolic blood pressure and heart rate increased by more than 20%, fentanyl and sevoflurane at a minimum alveolar concentration of 1-1.5 were administered intravenously (IV) at a dose of 1µg/kg to maintain general anesthesia. Furthermore, 0.03 mg/kg IV vecuronium was given as needed.Every participant received training on the use of VAS.

Carbon dioxide was pumped into the peritoneal cavity during the laparoscopy in order to sustain an intra-abdominal pressure of 12 to 14 mm Hg. After pneumoperitoneum was confirmed, patients were assigned to a group to which they would receive intraperitoneal medication through an umbilical port. In addition to bupivacaine, Group I received 16 mg of dexamethasone and 40 ml of 0.25% bupivacaine; Group II received 40 ml of 0.25% bupivacaine alone. Medication was administered via a 50 ml syringe that was attached to the umbilical port.

The patients were placed in the Trendelenburg position for ten minutes following the medicine's administration in order to facilitate drug distribution. Each person got an IV infusion of 1 gramme of paracetamol and 4 mg of ondansetron after the gas was deflated. At the end of the procedure, tracheal extubation was carried out after any residual neuromuscular blockade was corrected with 8 µg/kg glycopyrrolate and 50 µg/kg neostigmine. Those who needed an open cholecystectomy had open surgery instead, and the study did not include those who needed a drain to be placed.

The study examined pain at 0, 1, 2, 4, 8, 12, 16, and 24 hours after surgery using the VAS scale. This study assessed the incidence of hyperglycemia, the length of unpleasant events in the first 24 hours after surgery, the duration of postoperative nausea and vomiting, the time needed for the first rescue analgesic, and the total dose of rescue analgesic.

Rescue analgesics, such as 75 mg intravenously of diclofenac, were only given in the current trial when VAS values were more than 3. The milligrams and minutes of the first rescue analgesic were calculated. Four and twenty-four hours following surgery, hyperglycemia—defined as a blood sugar level of greater over 200 mg/dl—was measured using a glucometer.

Using the VAS scale, the study looked at pain at 0, 1, 2, 4, 8, 12, 16, and 24 hours following surgery. Incidence of hyperglycemia, duration of unpleasant events in the first 24 hours following surgery, length of postoperative nausea and vomiting, time required for the first rescue analgesic, and total dose of rescue analgesic were all evaluated in this study. In the current trial, rescue medications (e.g., 75 mg intravenously of diclofenac) were administered only when VAS values were greater than 3. The initial rescue analgesic's milligrams and minutes were computed. A glucometer was used to measure hyperglycemia, which is defined as a blood sugar level of more than 200 mg/dl, four and twenty-four hours after surgery.

## RESULTS

The goal of the current clinical experiment was to evaluate the analgesic efficacy of bupivacaine alone versus bupivacaine plus dexamethasone after laparoscopic cholecystectomy. The study also looked at the frequencies of postoperative nausea, vomiting, and hyperglycemia as well as the total number of rescue analgesics used and the time it took to take the first dose. Finally, two groups of twenty-one participants each were created at random from the 42 participants. All research participants had their baseline blood sugar levels, Apfel risk scores, demographic data, and postoperative nausea and vomiting recorded when they were finally included in the study. Group I recipients received 40 milliliters of 0.25%

bupivacaine mixed with 16 milligrams of dexamethasone intraperitoneally, while Group II recipients received 40 milliliters of bupivacaine only.

Mean age for Group I was 35.3±12.2 years, while mean age for Group II was

Group II had 23.80% (n=5) males and 76.19% (n=16) females, while Group I had 14.28% (n=3) men and 85.71% (n=18) women. The baseline blood sugar levels for those in Groups I and II were 113.4±25.9 and 123.3±31.0 mg/dl, respectively. The study participants in Groups I and II weighted 60.2±8.5 and 60.2±11.7 kg, respectively. Patients from Group I comprised 47.61% (n = 10) and Group II comprised 52.38% (n = 11) and 33.3% (n = 7) and 66.6% (n = 14) of the participants, respectively, with Apfel ratings of I and II. Table 1 shows that 66.6% (n=14) and 33.3% (n=7) of the participants in Group I and 52.38% (n=11) and 47.61% (n=10) of the individuals in Group II, respectively, had ASA statuses of I and II.

Groups I and II's VAS ratings were evaluated at 0 hours. The findings showed that Group II's VAS values (3.6±2.4) were significantly higher than Group I's (2.2±1.6, p=0.003). Similar results were found at one hour, with Group I's VAS score at 1.9±1.2 and Group II's VAS score at 3.0±1.3, respectively, with p=0.001. After two hours, the VAS ratings of Group II, which used bupivacaine alone, were significantly higher (1.9±0.8 and 2.9±1.4, respectively) than those of Group I, which combined the use of bupivacaine and dexamethasone (p-values <0.001). With p-values of 0.13, 0.88, 0.22, 0.07, and 0.32, respectively, there was no statistically significant difference in the VAS ratings between Group I and II at 4, 8, 12, 16, and 24 hours, as indicated in Table 2.

Group II needed a significantly higher total rescue analgesic dose (73.19±11.55 mg versus 60.73±29.82 mg, respectively; p=0.01) in relation to the study's features and findings. The mean initial rescue analgesic time for Group I was significantly higher (417.3-277.8 min) than for Group II (219.6±225.9 min; p=0.001). After 24 hours, there was a non-significant difference (p=0.42) in the mean random blood sugar levels. Table 3 demonstrates that at 4 hours, there was no statistically significant difference in Group I and II's random blood sugar levels (p=0.53).

DISCUSSION

Group I recipients received 40 milliliters of 0.25% bupivacaine mixed with 16 milligrams of dexamethasone intraperitoneally, while Group II recipients received 40 milliliters of bupivacaine only. The research approach employed was similar to previous studies by Asgari Z et al.7 (2012) and Nanda A et al.8 (2020), wherein the investigators assessed the comparative efficacy of bupivacaine plus dexamethasone against bupivacaine alone. Regarding the research subjects' demographics, it was noted that the mean ages of Groups I and II were 35.3±12.2 and 35.2±11.0 years, respectively.

Group II had 23.80% (n=5) males and 76.19% (n=16) females, while Group I had 14.28% (n=3) men and 85.71% (n=18) women. The baseline blood sugar levels for those in Groups I and II were 113.4±25.9 and 123.3±31.0 mg/dl, respectively.

Group I and II's study subjects weighed 60.2±8.5 and 60.2±11.7 kg, respectively. Patients from Group I comprised 47.61% (n = 10) and Group II comprised 52.38% (n = 11) and 33.3% (n = 7) and 66.6% (n = 14) of the participants, respectively, with Apfel ratings of I and II. In Group I, the patients' ASA status was I in 66.6% (n=14) and II in 33.3% (n=7), but in the other subjects, it was 52.38% (n=11) and 47.61% (n=10).

These findings aligned with studies carried out in 2016 by Sharma M et al. and in 2017 by Ljungqvist O et al., where the authors assessed individuals using data similar to that of the current study. After comparing the VAS ratings of Groups I and II at 0 hours, it was found that Group II had significantly higher VAS scores—3.6±2.4 compared to 2.2±1.6 for Group I—with a p-value of 0.003.

Similar results were found at one hour, with Group I's VAS score at 1.9±1.2 and Group II's VAS score at 3.0±1.3, respectively, with p=0.001. At two hours, Group I, which received both dexamethasone and bupivacaine, had significantly lower VAS ratings (1.9±0.8) than Group II, which received only bupivacaine (2.9±1.4). A p-value of less than 0.001 was found. Group I and II's VAS ratings did not significantly differ at 4, 8, 12, 16, or 24 hours (p-values of 0.13, 0.88, 0.22, 0.07, and 0.32, respectively). These results corroborated studies by Aberer F et al. (2021) and Srivastava V et al. (2022) that shown that bupivacaine by itself resulted in higher VAS ratings compared to bupivacaine plus dexamethasone combination.

Group II needed a significantly higher total rescue analgesic dose (73.19±11.55 mg versus 60.73±29.82 mg, respectively; p=0.01) in relation to the study's features and findings. Group I's mean initial rescue analgesic time was significantly longer than Group II's (209.6±225.9 minutes; p=0.001), at 417.3±275.8 minutes. After 24 hours, there was a non-significant difference (p=0.42) in the mean random blood sugar levels. At 4 hours, there was a non-significant difference (p=0.53) in the random blood sugar levels between Group I and II. These outcomes were consistent with those reported by Nasr Y et al. (2013) in 2022 and Upadya M et al. (2015), whose clinical characteristics matched those of the current study.

**CONCLUSIONS**

The current study, with its limitations taken into account, finds that, when compared to 0.25% bupivacaine alone, the intraperitoneal administration of 16 mg dexamethasone plus 0.25% bupivacaine significantly reduces postoperative pain and the need for rescue analgesics after laparoscopic cholecystectomy.

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**TABLES**

| S. No | Characteristics | Group I (n=21) | Group II (n=21) (Bupivacaine alone) |
|---|---|---|---|
| **1.** | **Mean age (years)** | 35.3±12.2 | 35.2±11.0 |
| **2.** | **Gender** | | |
| **a)** | Males n (%) | 3 (14.28) | 5 (23.80) |
| **b)** | Females | 18 (85.71) | 16 (76.19) |
| **3.** | **Baseline blood sugar (mg/dl)** | 113.4±25.9 | 123.3±31.0 |
| **4.** | **Weight (Kg)** | 60.2±8.5 | 60.2±11.7 |
| **5.** | **Apfel score n (%)** | | |
| **a)** | I | 10 (47.61) | 7 (33.3) |
| **b)** | II | 11 (52.38) | 14 (66.6) |

| | | | |
|---|---|---|---|
| **6.** | **ASA n (%)** | | |
| **a)** | I | 14 14 (66.6) | 11 (52.38) |
| **b)** | II | 7 (33.3) | 10 (47.61) |

**Table 1: Demographic data of two groups of study participants**

| S. No | Time (postoperative in hours) | Group I (n=21) (Mean ± S. D) | Group II (n=21) (Mean ± S. D) | p-value |
|---|---|---|---|---|
| **1.** | 0 | 2.2±1.6 | 3.6±2.4 | **0.003** |
| **2.** | 1 | 1.9±1.2 | 3.0±1.3 | **0.001** |
| **3.** | 2 | 1.9±0.8 | 2.9±1.4 | **<0.001** |
| **4.** | 4 | 1.7±0.9 | 2.6±1.2 | 0.13 |
| **5.** | 8 | 2.8±1.4 | 2.7±1.4 | 0.88 |
| **6.** | 12 | 2.3±1.0 | 1.9±1.0 | 0.22 |
| **7.** | 16 | 1.9±1.2 | 1.5±1.0 | 0.07 |
| **8.** | 24 | 1.3±0.4 | 0.11±0.9 | 0.32 |

**Table 2: VAS scores in two study groups at different time interval**

| S. No | Variables | Group I (Mean ± S. D) | Group II (Mean ± S. D) | p-value |
|---|---|---|---|---|
| **1.** | **Total rescue analgesic dose (mg)** | 60.73±29.82 | 73.19±11.55 | **0.01** |
| **2.** | **First rescue analgesic time (min)** | 417.3±275.8 | 219.6±225.9 | **0.001** |
| **3.** | **Random blood sugar at 24 hours (mg/dl)** | 140.2±154.6 | 118.6±19.4 | 0.42 |
| **4.** | **Random blood sugar at 4 hours (mg/dl)** | 127.7±29.7 | 132.0±31.4 | 0.53 |

**Table 3: Comparison of different study variables in two groups of study subjects**