

Comparison of Dexamethasone with Local Anesthetic versus Local Anesthetic for Laparoscopic Port Infiltration to Assess Effectiveness as Post-operative Analgesia

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Abstract

Original Research Article

Background: Early postoperative pain remains the most prevalent complaint after any surgery. Besides conventional analgesic medications, subcutaneous infiltration has been established as a reliable pain relief technique. The addition of dexamethasone to local anesthetic (example: bupivacaine, lidocaine) can also be used as it has some beneficial effects compared to the use of bupivacaine only. **Aim of the study:** The objective of this study was to evaluate the duration of analgesic effects of dexamethasone with local anesthetic as compared to local anesthetic in the post-operative patient. **Methods:** This randomized controlled trial study was conducted in among 60 patients who underwent Laparoscopic cholecystectomy. This study was conducted from January 2019 to June 2019. All patients who underwent laparoscopic cholecystectomy surgery were selected by purposive sampling. Data were compiled, edited, analyzed. The SPSS version 23 was used for data analysis. **Results:** Most of the patients in Group 2 have a long analgesia effect (NRS score more than 5), delay requirement of first rescue analgesia. NRS (Numerical Rating Scale) scores in Group 2 were persistently lower than that of Group 1. This revealed that the combination of Bupivacaine and Dexamethasone is quite effective in reducing port site pain in comparison to Bupivacaine ($P < 0.001$).

Keywords: Dexamethasone, local Anesthetic, Laparoscopic, Postoperative Pain.

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INTRODUCTION

Pain is not just a sensory modality but an experience. It recognizes the interplay among the objective, physiological sensory aspects of pain and its subjective, emotional & psychological components. The response of pain can be highly variable among different individuals as well as a different times. Surgical better outcome prominently depends on control of pain. Various ways of analgesic techniques ensure satisfaction to the patient. With conventional IV, neuraxial, enteral techniques local surgical site infiltration helps to minimize somatic pain which is a big concern for an anesthesiologist. That's why it gains popularity in various aspects nowadays. Many authors

keep their focus on the different mechanisms of pain after laparoscopic cholecystectomy. With different intensity and time courses, visceral and parietal pain seems to be the most important during the first 24-48 hours after surgery. A local anesthetic like bupivacaine has a half-life of 2.5 to 3.5 hours and has been reported to provide pain control for an average of 5 hours [1]. The margin of safety of the local anesthetic need for anesthesia is wide [2]. The upper limit is 2mg of bupivacaine per kg body weight, 100mg of the drug can be used safely in a patient with a lean body mass of 50 kgs [3]. The upper limit is 3mg of lidocaine per kg body weight, 150mg of the drug can be used safely in a patient with a lean body mass of 50 kgs. Controversy

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exists on the source of pain after laparoscopic procedures. Our study is designed to evaluate the effect of port-site infiltration of local anesthetic drugs and dexamethasone for pain relief following laparoscopic cholecystectomy to provide effective control of early postoperative pain. Recently dexamethasone has been studied as an adjuvant to local infiltration for postoperative pain management [4, 5]. Steroids have nerve block prolonging effects. They might bring about an effect by altering the function of potassium channels in the excitable cells. Dexamethasone is effective in pain reduction after surgery. The mechanisms of pain alleviation for the effects of dexamethasone include a drop in cyclooxygenase and lipoxygenase products by regulating phospholipases in the peripheral, as well as a reduction in bradykinin levels and the concentration of nerve proteins released from the periphery nervous system [6]. It has been reported dexamethasone that causes the prolonged duration of action of local anesthetics. Thus, dexamethasone has been selected as an adjuvant to bupivacaine to compare with local anesthetic only as postoperative pain management of laparoscopic cholecystectomy patients. The aim of our study is to evaluate the duration of analgesic effects of dexamethasone with local anesthetic as compared to local anesthetic only in surgical incision port for postoperative pain management of laparoscopic cholecystectomy patients.

MATERIALS AND METHODS

This was a prospective comparative double-blind study that was conducted from January 2019 to June 2019. The total sample was 60 patients were collected by purposive sampling from the study population of patients admitted into the Department of Surgery, Bangladesh Medical College Hospital (BMCH) according to the eligibility criteria. All the patients were enrolled by purposive sampling. Thereafter, they were scrutinized according to eligibility criteria and 60 patients were finalized. All the patients were divided into two groups named Group-1 and Group-2, which stood for Bupivacaine alone, and Bupivacaine with Dexamethasone respectively. Here, 12mL of 0.5% bupivacaine solution with 8ml normal

saline, a total of 20mL was infiltrated into the point site (6mL was infiltrated around each midline port site and 4mL administered in a similar fashion at the lateral port sites) in Group 1. On the contrary, Group 2 patients will have a 20mL solution containing 12mL of 0.5% Bupivacaine solution with 2mL of 10mg Dexamethasone, and 6mL of normal saline. The particular patients and volunteers who were observing as well as collecting data in the post-operative period, were in the dark regarding which drug the patients were being given, as it was a double-blinded RCT. After extraction of the gall bladder, inj. Paracetamol 1gm/100 ml IV was given to all patients of this study. Thereafter, when the surgeon closed the laparoscopic port with suture, 12mL of 0.5% bupivacaine solution with 8ml normal saline, a total of 20mL was infiltrated into the point site (6mL was infiltrated around each midline port site and 4mL administered in a similar fashion at the lateral port sites) in Group 1. On the contrary, Group 2 patients had a 20mL solution containing 12mL of 0.5% Bupivacaine solution, 2mL of 10mg Dexamethasone, and 6mL of normal saline. A predesigned questionnaire and a consent form were prepared. Data were collected, completed, edited, managed, and plotted into tabular and figure form. P-value was found statistically significant at <0.05 . All the qualitative variables were analyzed by chi-square test whereas all the quantitative variables were analyzed by 't-test'. The SPSS version 23 was used for data analysis.

RESULTS

Distributing the patient in demographic changes, age, sex, and BMI did not show any significant change. Most of the Group 2 patients had a long analgesia effect (NRS score more than 5), delay requirement of first rescue analgesia. Even total doses of rescue analgesia within 48 hours in Group 2 were lower than in group 1. NRS (Numerical Rating Scale) scores in Group 2 were persistently lower than that of Group 1. This revealed that the combination of Bupivacaine and Dexamethasone is quite effective in reducing port site pain in comparison to Bupivacaine ($P<0.001$).

Table-01: Distribution of patients according to demography (N=60; 30 in each group)

Characteristics	Group-1 (Bupivacaine) (n=30)	Group-2 (Bupivacaine + Dexamethasone) (n=30)	Total (n=60)
Mean age \pm SD (in years)	44 \pm 3	46 \pm 4	45 \pm 5
Age range (in years)	27 – 64	30 – 65	27 – 65
Sex ratio Male: Female	14:16	12:18	26:34
Mean weight (in kg)	58 \pm 8	60 \pm 7	59 \pm 5
Mean BMI	29 \pm 2	29 \pm 3	29
DM	11 (36.67%)	9 (30%)	20(33.33%)

In our study among the 60 patients, 34(56.67%) were female and 26 (43.33%) males. Table -1 shows the demography of study population. There

was no statistical significance among age, sex and body weight of patients in both groups.

Rescue analgesia requirements & VAS score (N=60; 30

in each group).

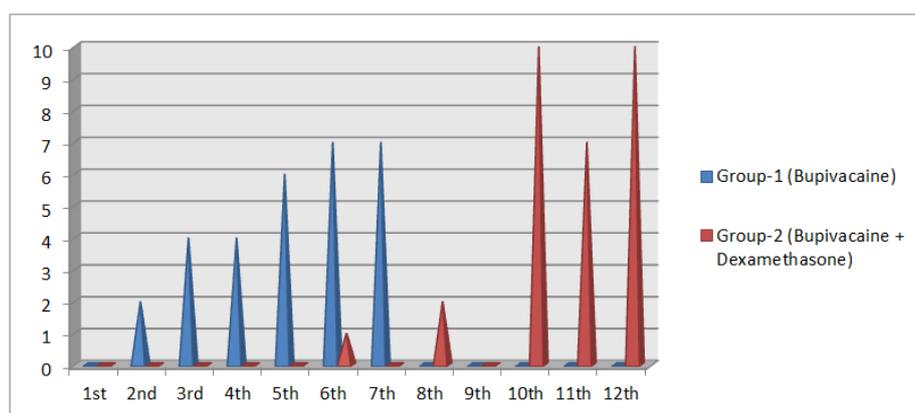


Fig-01: Distribution of patients according to first demand of analgesia

Figure-01 shows that hours of first demand of rescue analgesia were significantly higher in group 2 (Bupivacaine + Dexamethasone) than in group 1.

Average 10.75 hours in group 2 than 5.50 hours in group 1 ($p < 0.05$) which was significant.

Table-2: Distribution of patients according to rescue analgesia Inj. Pethidine requirements within 48 hours (N=60; 30 in each group)

Variables (Analgesia & VAS)	Group-1 (Bupivacaine) (n=30)	Group-2 (Bupivacaine + Dexamethasone) (n=30)	P-value
Total Number of Pethidine in 48 hours	4	2	0.02 ^s

P-value was calculated by student's t-test

P-value was significant at > 0.05

Table-02 shows that Group-2 patients required a statistically significant lower number of rescue analgesia Inj. Pethidine ($P=0.003$). Total 4(13.3%) and

2 (6.67%) out of 30 patients in group 1 and group 2 in each group required rescue analgesia respectively.

Table-3: Scenario in Diabetic Mellitus (Control) Patients

	Group 1	Group 2
First rescue analgesia average	6.75 th hour	11.50 th hour
Total DM patients	11	9

Table-3 shows that; in both groups, DM patients need less analgesia than non-DM patients. Moreover, the first rescue analgesia in group 2 is longer than group 1.

DISCUSSION

In the present study, patients required a statistically significantly lower number of rescue analgesia Inj. Pethidine ($P=0.003$) among study Group-2 (Bupivacaine-Dexamethasone). Adequate postoperative pain management is critical in the treatment of surgical patients. Effective postoperative pain management not only improves the patient's level of comfort and satisfaction, but is also linked to earlier mobilization, fewer cardiopulmonary complications, a lower risk of thromboembolism, earlier resumption of bowel function, a faster recovery, and lower hospital

costs [7]. Opioid analgesics that work on pain perception systems have traditionally been used to treat postoperative pain. While opioid analgesics such as morphine, hydromorphone, fentanyl, and meperidine are extremely effective, they are also associated with a slew of negative side effects such as somnolence, respiratory depression, cardiac instability such as hypotension and bradycardia, and nausea, vomiting, pruritus, and constipation[8]. Multimodal pain management aims for additive or synergistic effects by utilizing analgesic medications of various classes that have differing pharmacologic mechanisms of action in the nervous system[9]. By combining multiple drugs from different classes, multimodal pain management regimens aim to provide adequate pain management while reducing the amount of required postoperative opioid use and its associated adverse effects. Dileket *et al*. 2006 showed the Infiltration of the incision site with the

long-acting local bupivacaine after administering general anesthesia[10]. Timing of analgesia plays a major role in the reduction of postoperative pain scores and preventing the development of chronic pain syndrome[11]. Our study revealed that combined analgesia with dexamethasone-bupivacaine can reduce postoperative pain in comparison with only Bupivacaine. So, it can be claimed without hesitation that combined analgesia bupivacaine and dexamethasone can also decrease the total consumed analgesic. Lim *et al.* found that intravenous injection of Dexamethasone before and after laparoscopic cholecystectomy has been effective in reducing postoperative pain. A study by Fukamiet *al.* also showed that Dexamethasone in combination with Bupivacaine infiltration in the port site has significantly reduced postoperative pain after laparoscopic cholecystectomy [12]. Studies found no increase in infection associated with steroid administration[13]. But in this study, no such event was observed as it was not implemented intravenously. We used injection pethidine as rescue analgesics in our study. Here the dramatic improvement was also noted in Group 2, where only 14(46.67%) patients required rescue analgesia. On the contrary, 27(90%) patients asked for rescue analgesia in Group 2. If laparoscopic cholecystectomy is to be a routine ambulatory surgical procedure, the pain experienced by the patients during the early postoperative period must be addressed. Our study showed that the Infiltration of a combination of bupivacaine and dexamethasone into the port site in comparison to bupivacaine reduces the peak of pain occurring during the first 6 hours after the surgical procedure and significantly reduces the need for narcotic analgesics. Any reduction in such pain is relevant, particularly if it is statistically significant, whether the lower pain score translated into increased patient comfort and compliance is questionable. However, at whatever level they functioned they did so more comfortably.

CONCLUSION

Combination of Dexamethasone with Bupivacaine infiltration in the port site of laparoscopic cholecystectomy is much more significant in reducing post-operative pain, requirements of rescue analgesics, and pain score in comparison to only Bupivacaine infiltration in the same site. As it works with bupivacaine, it will work with other local analgesics too.

Ethical Clearance

The Ethics Committee of Bangladesh Medical College Hospital approved the study, and all patients gave their written informed consent to participate in the study.

Authors' Contributions

Mohammad Moinul Islam's contributions to conception and design, acquisition of data, analysis, and interpretation of data, in drafting the manuscript. ShamimaNasrinShadia's contributions to analysis and interpretation of data, in drafting the manuscript. Moazzem Hossain has been involved in the analysis and interpretation of data, in drafting the manuscript. All authors read and approved the final manuscript.

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