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Original Research Article

Comparative evaluation of subcutaneous infiltration (port site) vs intraperitoneal infiltration of bupivacaine on post laparoscopic cholecystectomy pain

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) is now the gold standard technique for the treatment of gallstones disease. Although pain after LC is less intense than after open cholecystectomy, some patients still experience considerable discomfort during early postoperative hours. The aim of this study is to evaluate the effect of intraperitoneal and port site instillation of local anaesthetics on pain relief in early postoperative period following LC.
Methods: This is a randomized, prospective analytical study among patients subjected to elective laparoscopic cholecystectomy. Patients were divided into 3 groups as; Group 1 was control, Group 2 was assigned to receive portside infiltration of bupivacaine, while group 3 received combined port site and intraperitoneal instillation of bupivacaine. The evaluation of postoperative pain was done according to the visual analog scale and the dosage of narcotic analgesics consumed and duration of hospital stay was also recorded.
Results: At 1st post-operative hour, minimum VAS score was in group 3 (p=0.003). At 4th post-operative hour, Minimum VAS score was in group 3(p=0.015). At 8th post-operative hour, Minimum VAS score was in group 3, (p=0.044). Patients in group 3 received a lower total amount of rescue analgesia and they also had the shortest hospital stay after LC, compared to the patients in the other groups. As regarding the incidence of right shoulder pain, group 3 has minimal no of patients experienced rt shoulder tip pain.
Conclusions: Infiltration of bupivacaine into port site and intraperitoneal space is simple, inexpensive and effective technique to minimize early postoperative pain and can be practiced for elective LC.

Keywords: Bupivacaine, Intraperitoneal, Laparoscopic cholecystectomy, Port site, VAS

INTRODUCTION

Laparoscopic cholecystectomy has replaced open cholecystectomy as the gold standard surgical procedure for majority of patients with gallstone disease.[1] Joris J et al demonstrated that abdominal pain following laparoscopic cholecystectomy can occur for a number of reasons; stretching of parietal peritoneum, release of inflammatory mediators of the soft tissue or dissection of the gallbladder of the liver bed.[2] Bisgaard T et al studied that in LC, overall pain is a conglomerate of three different and clinically separate components: incisional pain (somatic pain), visceral pain (deep intraabdominal pain), and shoulder pain (presumably referred visceral pain).[3] Many methods have been proposed to improve pain control such as the use of local anesthetics at the trocar site, intraperitoneal injection of local anesthetics, decreasing pneumoperitoneum pressure and decreasing the number of operative ports.

In the present study, author aims to compare the effect of combined intraperitoneal and port site infiltration of

bupivacaine with control group for pain relief following laparoscopic cholecystectomy, the duration of surgery, hospital stay, post-operative pain, rescue analgesia requirement, and comfort between both groups also observed.

METHODS

The present study was conducted as a randomized, prospective analytical study among patients who were subjected to laparoscopic cholecystectomy in the department of General Surgery of Gandhi Medical College, Bhopal between the period from January 2015 to May 2016.

Inclusion criteria

- Patient giving prior informed consent
- All patients undergoing elective laparoscopic cholecystectomy
- Age -(18-65) years, either sex

Exclusion criteria

- Patients allergic to local anesthetics.
- Patients underwent surgery for acute cholecystitis, conversion to an open procedure and intraoperative complications
- Morbid obesity, choledocholithiasis, previous upper abdominal surgery, chronic medical diseases, chronic opioid treatment and placement of drain.

Sixty patients participated in this study, with twenty patients in each arm and divided into 3 groups. Group A was the control group and did not receive either intraperitoneal or intraincisional bupivacaine. Group B: was assigned to receive local infiltration (port site) of 20ml solution of 0.25% bupivacaine at the end of operation before closure of the wound, using 5ml to each port. Group C received combined local infiltration and intraperitoneal instillation of 20ml solution of 0.25% bupivacaine in the gallbladder bed and under the right copula of the diaphragm following removal of the gallbladder. This was done using a catheter inserted through the right subcostal port. All patients received diclofenac 75mg intramuscularly at the end of the operation and repeat dose after 12 hr. Additional dose of analgesics considered as rescue analgesia, was administered on request. All patients were explained preoperatively about the use of visual analogue scale (VAS). Patients were assessed at 1, 4, 8, 12 and 24 hours after surgery postoperatively with the recording of Intensity of total pain. Analgesic consumption was also recorded. The number of patients experiencing right shoulder pain in each group was also recorded.

Statistical analysis

All data were expressed as Mean±standard deviation. Male and female ratio, rescue analgesic treatment and the occurrence of right shoulder pain that were percentages (%). Parametric data were compared between groups by analysis of variance (ANOVA). Chi-square methods were used for discrete variables. A two-sided probability value (P value) less than 0.05 was considered statistically significant.

RESULTS

Demographic data

Analysis of the demographic data of the studied patients has shown that all 3 groups were matched as regarding age and gender. Demographic data of the 3 groups of patients with gallbladder lesions who underwent LC (Figure 1,2). There were Twenty patients (17 women and 3 men) with Mean±SD age 38.7±8.3735 years in group A. In both group B and C. there were 20 patients in each with same sex distribution (16 women, 4 men).

The mean age was 39.4±10.1432 years and 41.05±11.6731 in group B and C respectively. Most of the patients were females (85%, 80% and 80% in group A, B and C, respectively). Cholelithiasis is more common in female patients.

P value was statistically insignificant for both age and sex distribution. The mean duration of surgery was insignificantly different among the three groups (52.75±5.25, 54.25±6.74 and 57±7.14 minutes in group A, B and C, respectively.

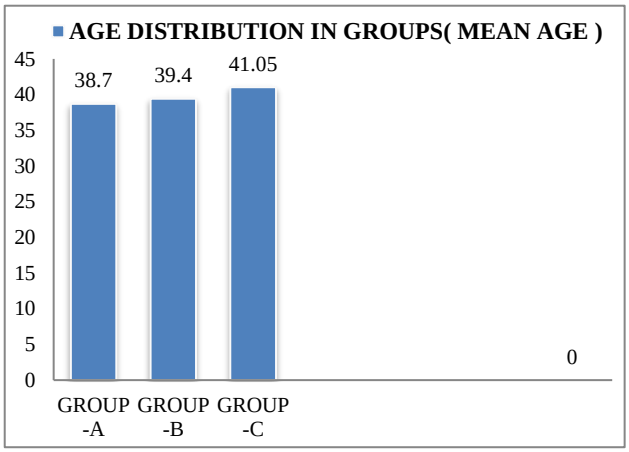

Figure 1: Mean age of patients in three groups.

Post-operative pain

All 3 patient groups experienced a gradual reduction in pain after laparoscopic procedures, as evidenced by VAS scores and the need for rescue analgesics. This difference was reported from 1st hour till 24 hours postoperatively. At 1st post-operative hour, the Mean±SD VAS score was 5.60±1.27, 4.50±1.43 and 4.25±1.11 for group A, B and C respectively. Minimum VAS score was in group C in which both intraperitoneal and port site infiltration of

bupivacaine used which is statistically significant (p=0.003) At 4th post-operative hour, the Mean±SD VAS score was 5.00±0.97, 4.25±1.11 and 4.10±0.96 for group A, B and C respectively. Minimum VAS score was in group C, which is statistically significant (p=0.015). At 8th post-operative hour, the Mean±SD VAS score was 4.10±0.85, 3.70±0.80 and 3.40±0.94 for group A, B and C respectively. Minimum VAS score was in group C Statistically significant (p=0.044). At 12th and 24th post-operative hours, minimal VAS score was observed in group C compared to A and B but it was statistically not significant.

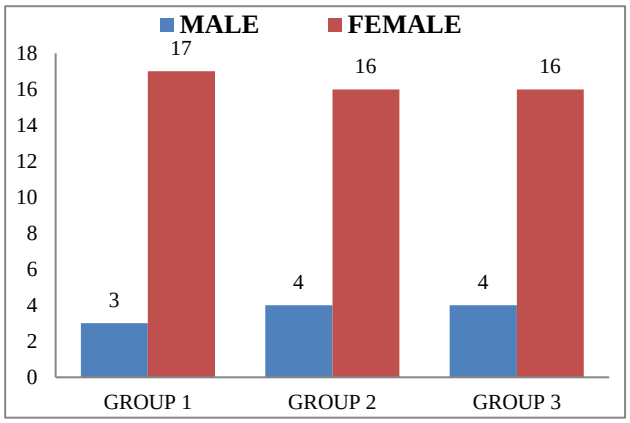

Figure 2: Sex distribution in three groups.

Table 1: Comparison of vas score between three groups assessed at 1, 4, 8,12 and 24 hours after laparoscopic cholecystectomy.

Vas score	Group- A Mean±SD	Group-B Mean±SD	Group-C Mean±SD	p value
1 hr	5.60±1.27	4.50±1.43	4.25±1.11	0.003*
4 hr	5.00±0.97	4.25±1.11	4.10±0.96	0.015*
8 hr	4.10±0.85	3.70±0.80	3.40±0.94	0.044*
12 hr	3.35±0.67	2.95±0.68	2.85±0.74	0.066
24 hr	2.00±0.79	1.75±0.91	1.50±0.68	0.153

Incidences of Rt shoulder tip pain

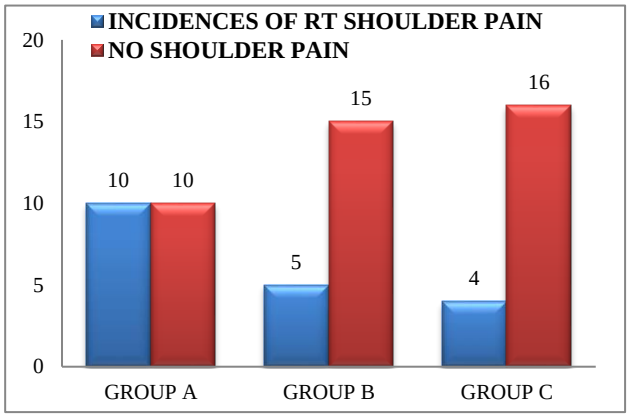

Figure 3: Incidences of Rt shoulder pain between three groups.

As regarding the incidence of right shoulder pain, group C has minimal no of patients experienced Rt shoulder tip pain i.e. 20 % patients, compared to group A and B which have 50% and 25 % incidences of same. Both group B and group C showed lower incidence compared to control group but statistically insignificant (p value=0.091).

Duration of hospital stay

The mean hospital stay in group A, B and C was 2.25, 1.9 and 1.6 days respectively. The C group patients had the shortest hospital stay after LC (1.6±0.68 days), compared to 2.25±0.78 days for the A group. As p value =0.030 which was statistically significant.

Table 2: Duration of hospital stay between three groups.

Duration	Group- A Mean±SD	Group-B Mean±SD	Group-C Mean±SD	p value
Hospital stay	2.25±0.78	1.9±0.78	1.6±0.68	0.03005

Request for rescue analgesia

Number of patients requested rescue analgesia was 85%, 50% and 45% in group A, B and group C respectively. Consumption of rescue analgesic was significantly lower in patients of group B and C compared to control group (p value=0.019).

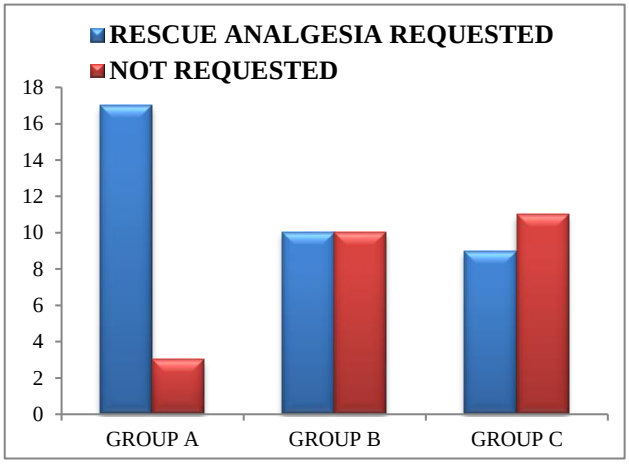

Figure 4: Request for rescue analgesia between three groups.

DISCUSSION

Laparoscopic cholecystectomy has become a standard technique for gallbladder surgery. Benefits in comparison to conventional cholecystectomy is less postoperative pain, shorter hospital stay, early return to work, cosmetically better outcome and Less tissue dissection. However, many patients complain of pain during the first 24 postoperative hours. It reaches a peak within the first few hours following the laparoscopic cholecystectomy

but diminishes with time. Controversy exists about the principal source of pain after laparoscopic procedure. Some clinicians mentioned that placement of trocars through the abdominal wall is the primary source; whereas others believe that most pain arises from intraperitoneal dissection and insufflations of CO_2 resulting in distension of abdominal wall and prolonged elevation of diaphragm.[4] Many researchers have suggested that the combination of somatovisceral local anaesthetic treatment reduces incisional, intraabdominal and shoulder pain in laparoscopic cholecystectomy. There are different routes to administrate the local anaesthetic drug; some researchers have shown that local parietal anaesthesia is effective in controlling postoperative pain, while others have shown that it is not effective.[5-7] A significant number of trials have examined the intraperitoneal administration of local anaesthetics in laparoscopic cholecystectomies as regards to postoperative pain and narcotic analgesic consumption, with promising results.[1,2,8]

Therefore, author evaluated postoperative pain by comparing the effect of combined intraperitoneal and port site infiltration of bupivacaine for pain relief following laparoscopic cholecystectomy.

Demographic data

All 3 groups had similar age distribution and sex ratio. Figure no.2 and 3 showing demographic data of the 3 groups of patients with gallbladder lesions who underwent LC. Most of the patients were females (85%, 80% and 80% in group A, B and C, respectively). Cholelithiasis is more common in female patients. *p* value was statistically insignificant for both age and sex distribution.

Post-operative pain

My study demonstrates that pain after laparoscopic cholecystectomy can be divided into three components; parietal, visceral, and shoulder pain that may have different intensities and their own time courses. Present study showed a significant difference in pain intensity in the early post-operative period at each of the assessment times. There is large variation in pain scores aside from individual difference in pain perception, many other patient and technical factors may have affected the scores. Author concluded that intraincisional infiltration of bupivacaine is more effective than intraperitoneal route in controlling postoperative abdominal pain. Pain peaks within the first few hours after the laparoscopic procedures, but diminishes by the next day, which was demonstrated by the distribution of pain scores and the requirement for analgesics. Port site (incisional) pain is more intense than visceral pain and dominates during the first 48 hours immediately following LC. Combined local (port site) and intraperitoneal infiltration of bupivacaine significantly reduced the immediate pain intensity, reduced the requirement of postoperative analgesics, and reduced the duration of the hospital stay. Patients who did not receive local and intraperitoneal infiltration of bupivacaine during surgery required significantly higher doses of analgesics as compared to patients who have got both the treatment.

Therefore, the combined use of local anaesthetics on incisions and intraperitoneum should provide the best pain control. My study shows differences in mean pain scores between the bupivacaine groups and control group during the 1st hours, 4th hours, and 8th hours postoperative assessment. Mean pain scores at 1st hours, 4th hours, and 8th hours were found to be statistically significant. Although author expected the effect of the local (port site) anaesthetic to wear off after the period of 6-8 hours, but there was no increase in the VAS score at the 4th pain assessment at 12th hours postoperatively in the patients who received both the treatments of bupivacaine. In the control group pain scores peaked immediately after the surgical procedure and then declined to the level comparable to that for the bupivacaine groups by the fifth assessment at 24hours postoperatively. Therefore, in this study the main effect of bupivacaine seems to have been on postoperative pain during the initial 6 hours after the surgical procedure. If laparoscopic cholecystectomy is to be a routine day case surgical procedure, the early postoperative pain experienced by the patients must be addressed. The present study showed infiltration of bupivacaine into the port site and intraperitoneal instillation reduces pain in the initial postoperative period and significantly reduces the need for narcotic analgesics.

Thus, this technique is simple, inexpensive, and effective, improves the postoperative period in hospital course and can be practiced routinely in all elective laparoscopic cholecystectomy. The results are consistent with that of Gouda M et al who studied intraincisional vs intraperitoneal infiltration of local anaesthetic for controlling early post laparoscopic cholecystectomy pain and found that postoperative abdominal pain was significantly lower with intraincisional infiltration of levobupivacaine.[9] This difference was reported from 30 minutes till 24 hours postoperatively. There are significantly lower incidences of Rt shoulder pain in incisional (port site) and intraperitoneal groups compared to control group. Although statistically insignificant, shoulder pain was less in intraperitoneal group than incisional (port site) group.[10] Demonstrated the effect and timing of local anaesthesia in laparoscopic cholecystectomy and showed reduction in the intensity of pain and opioid requirement.[11] demonstrated using multiregional local anaesthetic infiltration during laparoscopic cholecystectomy in patients receiving prophylactic multimodal analgesia showed a significant reduction in overall pain and narcotic requirements, however there was no significant effect on shoulder tip pain and overall pain (incisional and visceral) is reduced.[12] Demonstrated that applying at the port sites local anaesthesia with a ropivacaine infusion at the end of LC significantly decreased immediate postoperative pain

and his short term benefit explains the patient's reduced need for analgesics after LC and the earlier discharge of patients who received local anaesthesia infusions, compared to patients who did not have this treatment. The result are consistent with Neerja, who divided 50 patients into two groups to receive 20ml of normal saline intraperitoneally (group 1) or 20ml of 0.5% bupivacaine with 1:200,000 adrenaline (group 2) instilled at the end of surgery in the Trendelenburg position.[13] It was demonstrated that intraperitoneal instillation of bupivacaine with adrenaline produces lower VAS score up to 8 hours postoperatively. The postoperative analgesic requirements are also less but there is no difference in the shoulder pain between the two groups. Intraperitoneal bupivacaine for laparoscopic cholecystectomy reduces pain in the initial postoperative period.[14] Compared both intraincisional and intraperitoneal infiltration of local anaesthetic. These results have reported significantly more reduction of postoperative abdominal pain with intraincisional local infiltration of the anaesthetic drug.[15] Studied on intraperitoneal local anaesthetic for shoulder pain after day case laparoscopy and found intraperitoneal local anaesthetics to be more effective in reducing pain up to 48 hrs postoperatively in patients undergoing diagnostic laparoscopy. Using 20ml of 0.5% bupivacaine, noted a decrease in pain and consumption of analgesics probably due to a complete block of afferents using higher concentrations and volumes than used by other authors.[16-18] Failed to demonstrate any reduction in postoperative pain utilizing 20ml of either 0.25% bupivacaine or 0.5% lignocaine port site and intraperitoneal. In the results, there is significantly decreased immediate postoperative pain in patients who undergo laparoscopic cholecystectomy and found that the use of combined wound and intraperitoneal anaesthetics for LC patients increases postoperative patient's comfort. Studied the characteristics of pain after laparoscopic cholecystectomy and the effect of intraperitoneal instillation of 80ml of 0.125% bupivacaine with adrenaline.[2] They found that visceral pain accounts for the major discomfort experienced in early postoperative period whereas shoulder tip pain becomes the main complaint on the second day.

Keeping in view the importance of positioning while instilling the local anaesthetic Scheinin et al administered 100ml of either 0.15% plain bupivacaine or with adrenaline in 200 head down tilt maintained for 20 min, they found no relief of pain after laparoscopic cholecystectomy.[19] Concluded that the administration of bupivacaine up to a dose of 125 mg intraperitoneally after laparoscopic cholecystectomy fails to provide significant analgesic benefit.[20] Since significant side effects on pulmonary function and oxygen saturation occur, and not recommend intraperitoneal local anaesthetics for pain therapy after laparoscopic procedures. Compared pain relief from combined wound and intraperitoneal local anaesthesia for patients who undergo laparoscopic cholecystectomy and found that the use of combined wound and intraperitoneal anaesthetics for LC patients significantly decreased immediate postoperative pain.[7] This short-term benefit may explain the decreased use of immediate parenteral analgesics and earlier discharge. Ure BM et al used preincisional local anaesthesia with bupivacaine in laparoscopic cholecystectomy which was a double blind randomized clinical trial and didn't found any significant clinical benefits of wound infiltration after laparoscopic cholecystectomy.[21] Alam et al who studied on port site and intraperitoneal infiltration of local anaesthetics in reduction of postoperative pain after laparoscopic cholecystectomy, showed port site, intraperitoneal infiltration of local anaesthetics for postoperative pain relief is, in this context, an effective alternative method for early pain control and minimize the need of analgesics.[22] Rt Shoulder-tip pain, which was slight during the first postoperative hours, tended to become predominant after 24 hr, while parietal pain and visceral pain rapidly decreased. Subdiaphragmatic administration of 80ml bupivacaine 0.125% plus epinephrine l/200,000 had no significant effect on total pain, parietal pain, visceral pain, or shoulder-tip pain as compared with saline.[2] Some studies failed to demonstrate the beneficial effect of intraperitoneal instillation of local anaesthetics in patients undergoing laparoscopic cholecystectomy.[18]

Rt shoulder pain

Present study did not show any significant reduction in shoulder tip pain and it was consistent with the findings of Chandrigar and Bisgaard S and Michaloliakou who examined the effect of combined multiregional incisional and intraperitoneal local anaesthetic blockade in two RCTs.[11,23-25] Present study are consistent with Cunniffe MG et al who showed a significant decrease in shoulder tip pain after intraperitoneal bupivacaine using subdiaphragmatic administration of 80ml bupivacaine 0.125% plus epinephrine l/200,000 had no significant effect on total pain, parietal pain, visceral pain, or shoulder-tip pain as compared with saline.[26] Zmora and Elfberg demonstrate postoperative pain reduction with intraperitoneal bupivacaine after laparoscopic cholecystectomy, while Cunniffe have noted only reduced shoulder pain with overall pain not affected.[27,28] On the contrary, Elhakim et al have shown that intraperitoneal Lidocaine reduces effectively both shoulder pain and abdominal postoperative pain after laparoscopic cholecystectomy.[29] Gouda found reduction in Rt shoulder pain with intraperitoneal infiltration of levobupivacaine.[9] In the present study, post-operative right shoulder tip pain is less with patients who were assigned to intraperitoneal infiltration of local anaesthetic than those who are assigned to intraincisional infiltration of bupivacaine, yet it is not statistically significant. This insignificant result may be due to reduced contact of bupivacaine solution to the gallbladder bed as a result of the continuous flux of intraperitoneal liquids. This fact explains the large variation in results shown by different authors.

Hospital stays

The postoperative mean duration of hospital stay was lowest in group C, combined port site with intraperitoneal instillation of bupivacaine and this was statistically significant. The findings are consistent with Chun-Nan according to him use of combined wound and intraperitoneal anaesthetics for LC patients significantly decreased immediate postoperative pain. This short-term benefit may explain the decreased use of immediate parenteral analgesics and earlier discharge. Raetzelb M et al did not see any difference in the postoperative duration of hospital stay in all groups.

Rescue analgesia

The results are consistent with the findings of Pasqualucci et and Bisgaard and found an appreciable difference in total narcotic analgesics requirement between the control and bupivacaine groups.[16] Rademaker et al found no decrease in postoperative pain scores or opioid consumption after 20ml lignocaine 0.5% or 20ml bupivacaine 0.25%.[17] According to Joris J, analgesic consumption was similar in the two groups during the first 48 h postoperatively. Lepner, Zmora and Elfberg indicated that the postoperative analgesia and narcotic usage was not significantly different in the groups that received local anaesthesia.

CONCLUSION

In conclusion, laparoscopic cholecystectomy in now the gold standard for the treatment of gall stones disease. Pain after laparoscopic cholecystectomy is multifactorial. The use of combined wound (port site) and intraperitoneal bupivacaine for laparoscopic cholecystectomy patients is simple, inexpensive and effective technique to minimize early postoperative pain. It also decreases duration of hospital stay, reduced requirement of rescue analgesic dose and increases patients comfort.

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