

## A PROSPECTIVE STUDY ON LOCAL ANAESTHETIC INFILTRATION FOR POSTOPERATIVE PAIN RELIEF AFTER LAPAROSCOPY

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### ABSTRACT

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#### BACKGROUND

Laparoscopic surgery is a modern surgical technique in which operations are performed through small incisions and with the aid of a camera. Pain is the most common complaint following any surgery, but as compared to open surgery, the severity of pain is much lower in patients undergoing surgery via laparoscopy. The pain following laparoscopic procedure can be divided into three components- parietal pain, visceral pain and shoulder pain. The use of local long-acting anaesthetics reduces postoperative parietal pain. In this study, we tested the hypothesis that local anaesthetics instilled at the end of laparoscopic procedure are able to prevent postoperative pain during the first 24 hours post-surgery. The outcome measures were pain scores, analgesic consumption and time to analgesic request.

#### MATERIALS AND METHODS

This was a prospective study conducted by the surgical department, Pondicherry Institute of Medical Sciences for a period of 13 months. The study comprised of 50 patients with an ASA I or II who underwent laparoscopic procedures between April 2016 to May 2017. Patients in this study were randomly categorised equally into two groups; in the study group (Group A) patients received local anaesthetic infiltration with bupivacaine, while in the control group (Group B), patients did not receive local anaesthetic infiltration. Following history taking and physical examination, patients were subjected to routine laboratory investigations and ultrasonogram. Contrast-enhanced computerised tomography was done in patients when indicated and following which patients diagnosed with acute appendicitis or who had symptomatic cholelithiasis were taken up for laparoscopic surgery. In the study group, local anaesthetic was instilled at the end of surgery after port removal. The total volume of infiltrated solution in the study group was 10 mL divided proportionally according to the length of the skin incisions (3 mL for 10 mm incisions and 2 mL for 5 mm). The outcomes were then measured. Pain was measured using visual analogue score where patients were to verbally rate the pain into no pain = 0, light = 1, moderate = 2 or severe = 3. Pain scores were recorded at the third, sixth and twenty-four hours post-surgery. The time from wakeup post general anaesthesia to time of analgesic request was recorded. Postoperative pain for the first 24 hours was managed with the use of tramadol in a dose of 50 mg intravenously, which was provided based on pain score. Data was collected in a prospective manner and were analysed and compared with other studies. Data charting was done using MS Excel 2010.

#### RESULTS

A total of 50 patients were included in the study of which 22 were laparoscopic cholecystectomy and 28 were laparoscopic appendectomy. The analgesic dosing requirement for patients who did not receive local anaesthetic infiltration was found to be higher. Pain scores at the third, sixth and twenty-four hours following surgery using visual analogue scores suggested patients who had local port site infiltration with bupivacaine had better pain relief. The overall outcome with regard to pain management for patients undergoing laparoscopic procedure were found to be favourable with the usage of a long-acting local anaesthetic agent in this study bupivacaine.

#### CONCLUSION

We report that though pain is the most common complaint following a laparoscopic procedure, it can be managed to a certain extent with the use of a long-acting local anaesthetic. In both groups, pain was recorded, but in the study group where bupivacaine was used. It was found to be effective in managing port site pain as evidenced by visual analogue scores. Since, the incisional pain dominated throughout the first twenty-four hours, longer lasting local anaesthetics producing analgesia for several days maybe desirable.

#### KEYWORDS

Local Anaesthetic, Laparoscopy.

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## BACKGROUND

Early postoperative pain is the most common complaint after a laparoscopic procedure. Pain intensity peaks during the first postoperative hours and usually declines over the following 2-3 days.<sup>1,2</sup> Peripheral use of local anaesthetics for postoperative pain has become a popular practice in many open surgical procedures. However, the benefit of wound infiltration in open abdominal surgery appears most promising after minor procedures such as hernia repair; however, it is less beneficial in moderate-to-major procedures.<sup>3,4</sup> Compared with open procedures, laparoscopic surgery, a minimally-invasive technique is associated with reduced surgical trauma<sup>5,6</sup> and accordingly is often performed as daycare surgery. Peripheral use of local anaesthetics after laparoscopic surgery may therefore, as in the case of minor open procedures, be more likely to provide clinically relevant postoperative pain relief in the early postoperative period. Local tissue infiltration seems to be quite effective to prevent and control postoperative pain in the first 24 to 48 hours, in fact pain severity decreases after the first 24 hours.<sup>7</sup> Local tissue infiltration has a lot of advantages- simplicity, safety and low cost, the efficacy of this procedure has been investigated in several study, but without reaching a clear conclusion that shows the real benefits of this technique.<sup>8</sup>

Several studies have also noted the efficacy of local anaesthetics on postoperative pain reduction for laparoscopic procedures.<sup>9,10</sup>

We sought to perform a study where we tested the hypothesis that local anaesthetics instilled at the end of laparoscopic procedure are able to prevent postoperative pain during the first 24 hours post-surgery. The outcome measures were pain scores, analgesic consumption and time to analgesic request, which were recorded and compared.

## MATERIALS AND METHODS

This was a prospective study conducted by the surgical department, Pondicherry Institute of Medical Sciences for a period of 13 months. The study comprised of 50 patients with an ASA I or II who underwent laparoscopic procedures between April 2016 to May 2017. Patients in this study were randomly categorised equally into two groups; in the study group, patients received local anaesthetic infiltration with bupivacaine, while in the control group, patients did not receive local anaesthetic infiltration. Following history taking and physical examination, patients were subjected to routine laboratory investigations and ultrasonogram. Contrast-enhanced computerised tomography was done in patients

when indicated and following which patients diagnosed with acute appendicitis or who had symptomatic cholelithiasis were taken up for laparoscopic surgery. In the study group, local anaesthetic was instilled at the end of surgery after trocar removal. The total volume of infiltrated solution in the study group was 10 mL divided proportionally according to the length of the skin incisions (3 mL for 10 mm incisions and 2 mL for 5 mm). The outcomes were then measured. Pain was measured using visual analogue score where patients were to verbally rate the pain into no = 0, light = 1, moderate = 2 or severe = 3. Pain scores were recorded at the third, twelfth and twenty-four hours post-surgery. The time from wakeup post general anaesthesia to time of analgesic request was recorded. Postoperative pain for the first 24 hours was managed with the use of tramadol in a dose of 50 mg intravenously, it was provided based on pain score. Data was collected in a prospective manner and were analysed and compared with other studies. Data charting was done using MS Excel 2010.

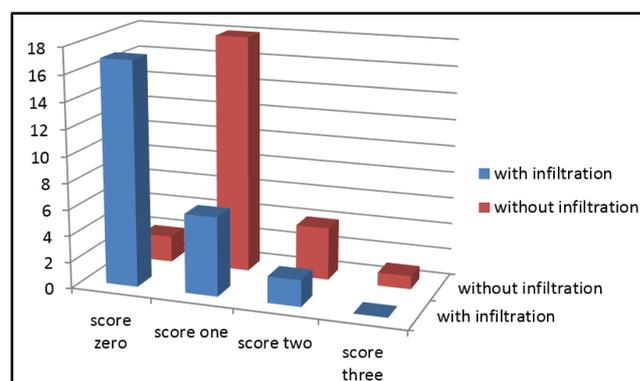


Figure 1

At the 6<sup>th</sup> hour post-surgery, though pain scores were found to be higher for both groups of patients using visual analogue score, pain scores for majority of patients who did not receive local infiltration rated a score of two as compared those who received local anaesthesia and who rated a score of one.

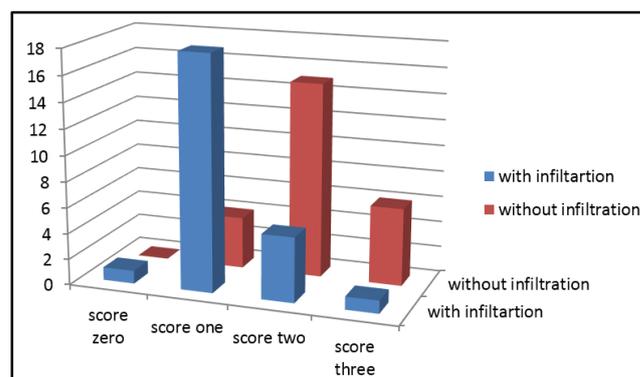


Figure 2

By the 12<sup>th</sup> hour although pain had reduced for both groups, pain scores for group B had pain scores higher than those in group A. This suggested that though intravenous analgesics were provided to both groups; those who

received local anaesthetic infiltration had much better pain relief as indicated by their pain scores.

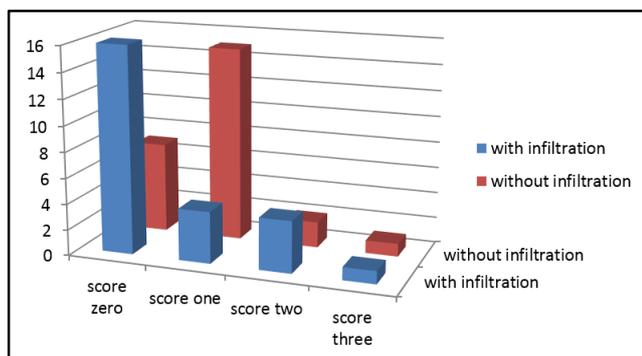


Figure 3

Tramadol was provided as an analgesic for both groups. It was provided at a dose of 50 mg intravenously. The first dose of analgesic provided at request was recorded and analysed. It was found that the time for analgesic request was prolonged for a majority of patients who received local anaesthetic infiltration.

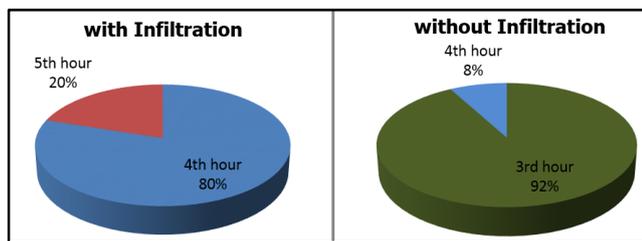


Figure 4 and 5

Analgesic requirement was quantified and recorded in both groups. While in the study group, twenty three patients required two doses of tramadol and two patients required three doses of 50 mg of intravenous tramadol. It was found that in the control group, eighteen patients required two doses of tramadol while seven patients required three doses of tramadol. The dosing in this group was found to be higher as compared to the study.

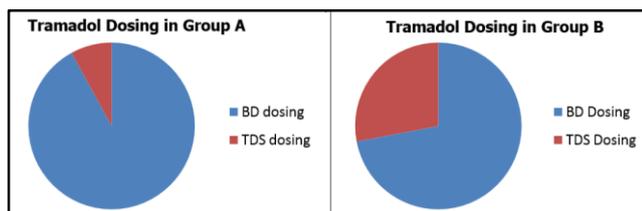


Figure 6 and 7

**DISCUSSION**

Our principal finding was that local infiltration of port site with a long-acting local anaesthetic reduced pain in patients who underwent laparoscopic appendectomy and laparoscopic cholecystectomy. Early postoperative pain is the most common complaint after a laparoscopic procedure. Pain intensity peaks during the first few hours postoperatively and usually declines over the following 2-3 days.<sup>1,2</sup> Peripheral use of local anaesthetics for postoperative

pain has become a popular practice in many open surgical procedures. Infiltration of local anaesthetic into the surgical site at closure provides temporary analgesia and is one aspect of the multimodal approach to postsurgical analgesia recommended in current guidelines.<sup>11,12</sup> In our study, we used bupivacaine. Bupivacaine exerts local anaesthetic activity by binding directly and reversibly to the intracellular portion of sodium channels located in the plasma membrane of nerve cells. The bound drug decreases the influx of sodium ions, thus preventing cell depolarisation and the propagation of impulses along the nerve. As with all local amide anaesthetics, the degree of nerve block produced by bupivacaine is governed by how frequently the nerve is stimulated (i.e., how often the sodium channels are open and exposed to the drug), the diameter of the nerve and the presence of myelination. Small myelinated nerve fibers are more sensitive to local amide anaesthetics than large, unmyelinated nerve fibers. Because pain is transmitted by small myelinated nerve fibers, pain is blocked more readily by local anaesthetics than impulses transmitted by larger myelinated nerve fibers that mediate touch, pressure, muscle tone and postural sensations. This explains why people can still feel touch, but not pain when receiving local anaesthesia.<sup>13</sup> Bupivacaine is highly lipid soluble. Lipid-soluble drugs are more able to penetrate connective tissue and cell membrane walls than those that are less soluble.<sup>13</sup> once absorbed, the duration of action of bupivacaine is determined by its protein-binding capacity. Anaesthetics with a high affinity for proteins remain bound to nerve cells longer. This affinity for proteins also reduces the potential for systemic toxicity by decreasing the amount of free drug circulating in the blood.<sup>13</sup> Local tissue infiltration seems to be quite effective to prevent and control postoperative pain in the first 24 to 48 hours in fact pain severity decreases after the first 24 hours. Since incisional pain dominated throughout the first postoperative week, longer lasting local anaesthetics producing analgesia for several days maybe desirable. Although, in our study, we used bupivacaine for infiltration, which provides a base platform of postsurgical pain management. The duration of action of conventional bupivacaine hydrochloride and other available local anaesthetics is limited lasting 7 hours or less.<sup>14</sup> This warrants further studies, which maybe done using newer and longer acting local anaesthetics for pain management in patients undergoing laparoscopic procedure.

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