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Comparison of the Role of Intrapleural Bupivacaine Injection with Intravenous Morphine in the Management of Post-Operative Pain after Open Cholecystectomy

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ABSTRACT

Background: *Post-operative pain after open cholecystectomy can result in increased oxygen consumption, increased risk of myocardial ischemia, atelectasis, pneumonia, decreased vital capacity, and increased morbidity and mortality. In this study we compared the analgesic effects of intrapleural bupivacaine with intravenous morphine post-operatively.*

Materials and Methods: *Sixty patients who were candidates for elective open cholecystectomy were randomly divided into two groups based on randomized numbers for a double-blinded randomized clinical trial. Anesthesia technique was precisely the same for all patients. At the end of surgery, 20 cc of 0.5% bupivacaine and epinephrine with a concentration of 1/200,000 was injected intrapleurally for group B patients; whereas, 0.1 mg/kg intravenous morphine and 20cc normal saline was injected intrapleurally for group M cases.*

Results: *In order to obtain a visual analog scale(VAS) <3, morphine consumption up to 12 hours post-op was 10.5±3.2 mg in group M which was much more than that of group B, in which this amount was 4.3±1.5 mg. This difference was statistically significant (P<0.05). The mean frequency of morphine injection was 3.7±1.3 times in group M and 1.2±0.7 times in group B and the difference in this regard was statistically significant. The patients' first demand for morphine was 1.8±0.6 and 4.2±0.3 hours postoperatively for groups M and B respectively. The difference in this regard was statistically significant (P<0.05).*

Conclusion: *In this study we realized that a single shot of intrapleural bupivacaine can provide an almost favorable analgesia for the management of post-operative pain due to open cholecystectomy compared to other current analgesic methods. It may reduce the related complications as well. We observed no complication due to the single shot of intrapleural bupivacaine.* ***(Tanaffos 2010; 9(2): 50-53)***

Key words: *Cholecystectomy, Intrapleural injection, Bupivacaine, Intravenous morphine*

INTRODUCTION

Uncontrolled post-operative pain may aggravate some of the related complications and increase patients' morbidity and mortality. Post-operative pain management, especially with certain types of analgesic regimens, may decrease related morbidity and mortality (1).

Uncontrolled postoperative pain may result in sympathetic activation and increase myocardial

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oxygen consumption, which may be important in the development of myocardial ischemia and infarction (1, 2) by decreasing myocardial oxygen supply through coronary vasoconstriction and attenuation of local metabolic coronary vasodilation (1).

Activation of the sympathetic nervous system may also delay the return of post-operative gastrointestinal motility, which may develop into paralytic ileus (1,2).

Poorly controlled acute postoperative pain may be an important predictive factor in the development of chronic post-surgical pain (CPSP) (3,4).

Opioid analgesics are among the main options for the management of post-operative pain (5).The analgesic efficacy of opioids is typically limited by the development of tolerance or opioid-related side effects such as nausea, vomiting, sedation or respiratory depression (6).

Peripheral regional analgesia obtained by a single injection or continuous infusion can provide analgesia superior to that obtained by systemic opioids (7) and may result in various outcomes (8). A variety of wound infiltration and peripheral regional techniques can be used to enhance postoperative analgesia. Peripheral regional techniques may have several advantages over systemic opioids (i.e., superior analgesia and decreased opioid-related side effects) and neuraxial techniques (i.e, decreased risk of spinal hematoma) (9).

MATERIALS AND METHODS

Our understudy cases were 60 patients (ASA class I, II) who were not addicted to opium or any other substance and were suffering from pain. They were under chronic analgesic treatment and were candidates for elective open cholecystectomy at Loghman General Hospital in spring and summer 2008. They were randomly divided into two groups (based on randomized numbers, 30 patients each) for a double-blinded randomized clinical trial. Anesthesia technique was quite the same for all patients: after infusing 5ml/kg Ringer's solution, premedications including midazolam 0.03 mg/kg/IV and fentanyl 2µg/kg/IV were administered, then induction of anesthesia was performed with sodium thiopental 4mg/kg/IV and atracurium 0.5mg/kg/IV. For maintenance of anesthesia, propofol and remifentanil were infused at the rates of 100 µg/kg/min/IV and 0.05µg/kg/min, respectively. Patients were ventilated with a mixture of O2 and N2O, each at 50% concentration.

Atracurium was repeated every half an hour at the dose of 0.2 mg/kg/IV. Monitoring of anesthesia depth was done with Bis (Bispectral index) in order to confirm same depth of anesthesia for both groups. At the end of surgery, muscle relaxants were reversed, but propofol and remifentanil infusion were continued for group B patients. After prep and drape, through the 7th intercostal space on midaxillary line on the right side of the chest wall a Tuohy epidural needle was introduced into the pleural space. Appropriate position of the needle was confirmed with negative pressure aspiration of hanging drop of sterile water on the hub of the needle then 20ml of 0.5% bupivacaine and epinephrine at the concentration of 1/200,000 was injected intrapleurally and 0.1ml/kg/IV normal saline was administered for group B patients. For group M, 20ml normal saline was injected intrapleurally and 0.1mg/kg morphine was infused intravenously by the first anesthesiologist. Chest X rays were ordered to detect pneumothorax. When assessing patients' pain levels, injection sites were examined for subcutaneous emphysema.

VAS score of patients was assessed immediately after entering the recovery room and then every 2 hours by the second anesthesiologist; intravenous morphine,1 mg each time, was injected to either obtain a VAS score equal or less than 3 which was

considered analgesia, or reach the maximum dose of 0.1 mg/kg.

The number of times patients suffered a VAS >3 and demanded analgesics, and the amount of analgesics prescribed, were recorded during the first 12 hours after surgery. Finally, we retrospectively calculated the amount of morphine prescribed for groups B and M.

Patients who received other analgesics or needed reoperation were excluded from the study. Concerning other similar studies, this study is precisely ethical since there had never been any complication related to invasive procedure.

RESULTS

There was no statistically significant difference between the 2 groups concerning age, gender, weight and duration of surgery (Table 1).

Table 1. Demographic data in understudy subjects.

	M n=20	B N=30	P value
Age	35±2.3	34.8±5	Ns
Sex (F/M)	17/13	16/14	Ns
Weight (Kg)	72.5±10	73±12	Ns
Duration of surgery (h)	1.8±0.8	1.5±1.2	Ns

Comparison of means: Chi-square; fractions: independent t-test
Ns= not statically significant
M= Male F=Female

The amount of morphine consumption in the first 12 hours after termination of surgery in order to obtain VAS equal or less than 3, was 10.5±3.2 mg in group M and 4.3±1.5mg in group B and this difference was statistically significant (P<0.05).

The first demand for morphine was 1.8±0.6 hours after entering the recovery room in group M. This figure was 4.2±0.3 hours in group B. The difference in this regard was statistically significant (P<0.05).

The comparison of means was done using independent t-test and chi-square test (Table 2).

Table 2. The amount and demands of morphine.

	M n=20	B N=30	P value
Amount of morphine consumption in first 12 h(mg)	10.5±3.2	4.3±1.5	<0.05
Frequency of morphine demands	3.7±1.3	1.2±0.7	<0.05
First morphine demand after recovery(h)	1.8±0.6	4.2±0.3	<0.05

Comparison of means using independent t-test

DISCUSSION

According to our study results, intrapleural bupivacaine injection will decrease the opioid demand for the post-operative pain management. This finding was in accord with those of el-Naggar's (10) and Stromskag's (11) studies Most researches on intrapleural injections have studies post-thoracotomy pain management, such as Landesberg's study (12) while our study showed that this method could also be applied for upper abdominal surgeries.

Stromskag (11), who used 3 different concentrations of bupivacaine for pain management (0.25% , 0.375% , and 0.5%), concluded that 0.5% concentration could control post-operative pain more effectively and decreased opioid injections in the third group (11). On the other hand, serum levels of bupivacaine in the 3rd group were significantly more than that of other groups (0.25% and 0.375%). We employed 0.5% bupivacaine for better analgesia and epinephrine for reducing the risk of toxicity (12).

In our survey, we used single shot injections in hope of reducing catheter related complications and promoting patients' comfort, but in Landesberg (12), Stromskag (11) and el-Naggar (10) studies, catheters were inserted. In these studies, authors did not encounter any complication due to catheters in place, but theoretically they described the risk of catheter displacement and its related complications (10-12).

In this study, there was no case of pneumothorax, while in Rose study (13) one case of pneumothorax

was reported who did not require any intervention.

Considering all the above, this method can be regarded as a good method of analgesia with minimal risks for the management of post operative pain.

In this study we considered VAS<3 as the acceptable pain score, equal to an appropriate analgesia.

In conclusion, our study showed that intrapleural bupivacaine injection can effectively control post-operative pain after open cholecystectomy, and can also decrease the need for opioid consumption and delay patients' first demand for analgesics.

This method can definitely decrease patients' pain and agony without any major complication.

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