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Comparison of pre incisional versus post incisional infiltration with 0.5% ropivacaine for post-operative analgesia in patients of open cholecystectomy under general anaesthesia

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Abstract

Background: Pre-emptive analgesia is the administration of analgesics before starting the painful stimulation to prevent the CNS sensitization, thus decreasing the post-operative pain intensity. Aim of the study was to compare postoperative analgesia in patients between pre incisional infiltration and post incisional infiltration with 0.5% ropivacaine in patients of open cholecystectomy under general anaesthesia

Materials and Methods: In this prospective, observational study, 30 patients belonging to ASA I or ASA II were allocated to two groups as group a, group Beach. After conventional general anesthesia, patients belonging to group A received 2 mg/kg (20ml) of 0.5% ropivacaine infiltration before incision and patients belonging to Group B received the same as wound infiltration before closure. Injection diclofenac sodium intravenous was given as a rescue analgesia when required. Statistical analysis was done using unpaired t test. We observed pain intensity with Visual Analogue Scale (VAS) at 0, 1,3,6,8 and 12hrs, time for first analgesic requirement, total diclofenac sodium consumption.

Results: Mean VAS score immediately after the surgery for group A was (3.2±1.15) significantly lower than group B (4.13±1.46, P=0.0104). First analgesic dose requirement time was longer in group A (7.5±1.5hrs) than group B (4.3±1.7hrs, P=0.0104). Total amount of diclofenac sodium required in group a (65.8±20.8mg) was less than group B (110±25.8mg).

Conclusion: Pre incisional infiltration with 0.5% ropivacaine significantly decreases post-operative pain intensity and diclofenac sodium consumption. Infiltration has better effect when given pre-emtively.

Keywords: infiltration, post-operative analgesia, pre-emptive analgesia, ropivacaine

Introduction

Preoperative wound infiltration as the method of preemptive analgesia was first addressed as early as 1978. Since then, understanding of the physiology of acute pain has improved. Basic science studies demonstrate that pain continues after injury due to physiological disturbances in the nervous system, including a reduction in the thresholds of tissue nociceptors (hyperalgesia) and an increase in the excitability of the central nervous system (hyperexcitability or central sensitization). As a result normal inputs evoke exaggerated responses. Inhibition of these disturbances ("preemptive analgesia) may be of useful in prevention of postoperative analgesia. The main clinical inference of this knowledge for the management of acute postoperative pain has been the topic of discussion in recent years. Results are incompatible, with only few clinical studies supporting the physiology. Previous controlled studies have shown that preoperative infiltration with a local anesthetic has a clinical benefit on postoperative pain management. Yet most studies have involved brief and superficial surgical procedures such as herniorrhaphy and tonsillectomy [1-4].

The pain management was with a focus on pain prevention and used the concept of "balanced analgesia," i.e., pain management by combining analgesics with different mechanisms of action, resulting in sufficient analgesia with fewer side effects due to additive/synergistic action between the drugs [1].

In patients receiving regional anaesthesia like spinal, epidural and peripheral nerve blocks, drugs like fentanyl, clonidine, adrenaline etc are used due to their adjuvant effects for postoperative analgesia. Whereas in patients receiving general anaesthesia, paracetamol infusion, fentanyll, diclofenac sodium etc are used for postoperative analgesia.

Local wound infiltration with local anesthetics has been suggested to decrease perioperative opioid consumption and postoperative pain, however there is a study which could not show much differences in postoperative pain intensity with pre or postoperative infiltration with bupivacaine. Decreased analgesic requirement and increased duration for rescue analgesic with bupivacaine infiltration before incision as compared to postoperative infiltration has been shown in meta-analysis, however there was no evidence of decreased postoperative pain intensity.

Present study was carried out to compare the post-operative analgesia in patients of open cholecystectomy under general anaesthesia with reference to

- VAS score
- Time for first rescue analgesic
- Total number of dosage of analgesic

Method

In this prospective observational study, after obtaining the

institutional ethics committee approval, total 60 adult patients of either sex, ASA grade I & II, aged 25-45 years, undergoing elective open cholecystectomy under general anaesthesia were included. Written informed consent from each patient was taken. Patients with ASA grade III & IV, Obese patients, Emergency open cholecystectomy, Allergic to local anesthetic drugs, Concurrent treatment with anticoagulant drugs, chronic pain, history of drug abuse, diabetes were excluded from the study.

Pre-anesthetic evaluation of all patients was done. All patients were kept nil by mouth prior to surgery. Vital signs recorded in pre-operative room and was considered as baseline values. Patients were divided into two groups having 30 patients each. After conventional general anesthesia, patients belonging to group a received 2 mg/kg (20ml) of 0.5% ropivacaine infiltration before incision and patients belonging to Group B received the same as wound infiltration before closure. All patients were extubated and were transferred to post-operative ward for monitoring of hemodynamic parameters, VAS score and complications.

Postoperative pain was evaluated at 0, 1, 3, 6, 8 and 12 hours after extubation. Extubation was chosen as point 0. Pain intensity was scored on a self-rating visual analog scale, and patients were asked to describe the pain as deep and/or superficial. Patients were asked about nausea, vomiting, and dizziness. The postoperative care unit patients received analgesics on demand. Pain score was evaluated by a blinded observer anesthesiologist immediately after extubation and hourly till 24 hours using VAS score. Statistical analysis was done using unpaired t test.

VAS score, the time for first analgesic, number of dosage of analgesic given and total analgesic requirement for the first 24hours were recorded. Rescue analgesic given with inj. diclofenac sodium 75mg intravenously on demand or when VAS score exceeded 4.

Table 1: Demographic data of patients

Variables	Group Aup A	Group Broup B
Age(years) **(years)**	40.5±5.2	42.8±8.2
Sex(M:F)	12:8	11:9
Weight (kg)	60.6±12.3	59.8±11.8
Height (cm)	168±5.8	170±4.8
Duration of surgery(minutes)	130±26.7	122±35.8
Site of incision	Right subcostal	Right subcostal

Table 2: (Mean VAS score)

Time (hours)	Group A	Group B
0	2.033333	2.333333
1	2.233333	3.066667
3	2.666667	3.533333
6	2.666667	4.366667
8	4.233333	5.166667
12	4.933333	5.333333

Mean VAS score

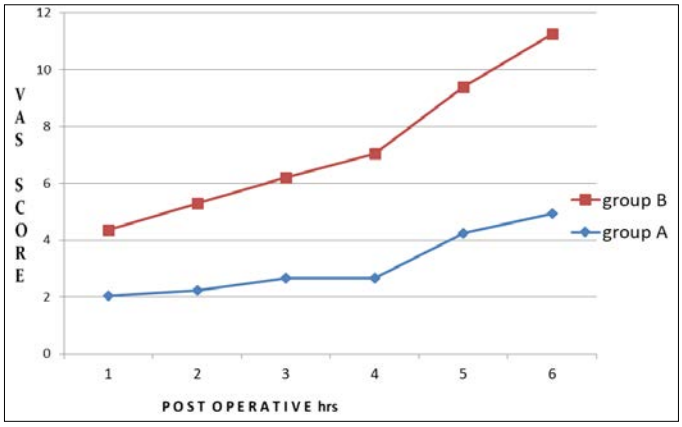

Fig 1

Table 3

	Group A Mean±SD	Group B Mean±SD
Time for first rescue analgesic(hrs)	7.5±1.5	4.3±1.7
Total dose of diclofenac sodium(mg)	65.8±20.8	110±25.8

Discussion

Poorly managed pain may inhibit the early ability to mobilize the patient and may influence the overall result. Infiltration analgesia by local anesthetic agent has been increasing in practice for post-operative pain management. After infiltration into the surgical wound, these drugs modulate peripheral pain transduction by inhibition of the transmission of painful impulses from the site of injury. These new techniques have led to a better quality of analgesia and a significant decrease in the consumption of systemic analgesics in the first 24 post-operative hours [5].

As to rescue analgesic consumption, which is probably the most adequate evaluation to signify the effect of preemptive analgesia, there has been clear benefits of ropivacaine infiltration and best results were also obtained with preemptive local infiltration [6].

Study by Andre *et al* in comparing preemptive and postoperative infiltration, it was observed 72% decrease in morphine requirement (1.5 mg versus 5.5 mg) ($p < 0.005$) [6].

In our study total requirement of analgesic (diclofenac) dose in group A is 65.8±20.8mg as compared to group B 110±25.8mg which shows the less requirement of analgesic in pre-incisional group.

Time for first rescue analgesic dose requirement, also a criterion adopted by several studies to evaluate pain, was favorable for groups receiving ropivacaine infiltration, especially for the preemptive group.

In our study time for rescue analgesic in group A is 7.5±1.5hrs as compared to 4.3±1.7hrs in group B which indicates longer duration of post-operative analgesia in group a (pre emptive analgesia).

Again, as for pain intensity, this difference was probably due to non-sensitization of nervous receptors in the preemptive group. Group receiving wound infiltration after residual

anesthesia recovery, starts to have pain and already requires rescue analgesic in very short duration post opeartivelyn [6] Studies by Johnson B *et al* with pre-emptive ropivacaine infiltration using 200mg and 175mg doses for herniorrhaphy and cholecystectomy and found reduction in pain limited to 6 hours post-operatively [4]. Results have shown clear benefit for pain control with ropivacaine infiltration, especially with preemptive local infiltration.

A study done by Bianconi *et al* reveals that post-operative pain control after spine fusion surgery at rest and on mobilization was better with 0.5% ropivacaine wound infiltration and continuous ropivacaine 0.2% wound perfusion than with systemic analgesia. This is incompatible with our study.

Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate myelinated motor fiber, resulting in a reduced motor blockade, and also the reduced potential for central nervous system toxicity and cardio toxicity. Thus, it has greater degree of motor sensory differentiation and greater degree of safety margin [4, 9].

Single shot intra operative wound infiltration reduces the median time for rescue analgesic, the VAS scores, use of analgesic medication on the first post-opearative day and increases number of patients using no analgesic. This issimilar to data obtained by our study. Andre Laranjeira *et al* studied 2mg/kg 0.75% ropivacaine before incision and after incision. The data of the study shows that morphine consumption was significantly lower in pre-incisional group as compared to the pre-closure group or the control group. Time for the first analgesic requirement was also longer with lowest pain intensity in pre-incisional group. Similar to this our data also shows ropivacaine infiltration before incision has decreased post-operative pain intensity, rescue analgesic consumption as compared to ropivacaine infiltration at wound closure. The time for rescue analgesic dose requirement was significantly longer in pre-emptive infiltration group than at wound closure. Number of doses of rescue analgesia required less in group a [4].

In the study done by Johansson A *et al* pre-operative ropivacaine infiltration for breast surgery with 0.3mg/kg of 3.75mg/ml before surgery and found no significant difference between VAS scores. This may be because of low dose (average patient weighing 60kg will receive 65mg with this protocol) of ropivacaine which might not sufficient to affect post-operative pain. A comparative study done by M.A.I. Rica and *et al* with pre-emptive versus post-operative ropivacaine wound infiltration found the pre-emptive group had wider angles of shoulder abduction in post-operative period [4, 7].

Only 3 out of 60 patients suffered from complications of wound infiltration.1 out of them developed wound infection and 2 patients had hematoma at the wound site.

The present literature doesn't support this assertion, and no controlled infiltration study has focused on the infection subject. This study doesn't include an adequate number of patients to allow conclusions on complication rates. The observed wound complication rate, however, is not different from what is reported for major surgeries in the hospital survey and is not different from the 2%-5% as is reported in the literature [1].

Conclusion

Ropivacaine infiltration was more effective for post-operative pain control with better results when done before incision. It has significantly decreased pain intensity and diclofenac sodium consumption and has delayed first rescue requirement.

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