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ORIGINAL ARTICLE

Postoperative Pain Relief: Comparison of Bupivacaine before Incision and Near Closure of Wound among patients Undergoing Open Abdominal Surgical Procedures

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ABSTRACT

Background: Pain is the most common and most difficult problem faced by patients after operation. Due to inadequate management 30-70% patients suffer from post-operative pain. Acute pain resulting in chronic pain reduces quality of life and creates economic burden.
Aim: To compare post-operative pain relief between infiltration of 0.25% bupivacaine into skin and subcutaneous tissue in the line of incision before incision and along edges of wound near completion of procedure.
Study design: Randomized control trial
Methodology: Sixty four patients were randomly divided into two groups i.e. (0.25% Bupivacaine 6 to 30ml) at the site of incision into skin and subcutaneous tissue Preincision (Group P) and (0.25% Bupivacaine 6 to 30ml) along the edges of wound at near closure of procedure (Group C). Intensity of pain was assessed on visual analogue scale in the recovery room, 3, 6 and 24 hours postoperatively.The time of first dose of rescue analgesia within 24 hours was also noted in both groups.
Results: There was no statistically significant difference between two groups regarding age (p-value = 0.324), gender i.e. males (p=0.545) females (p=0.763) and duration of operation (P=Value=0.208). The mean time of rescue analgesia in Group P and Group C in minutes was 318.12±149.47 and 374.84±125.67 respectively (p value =1.5) reflecting no statistically significant difference.
Conclusion: Postoperative analgesia and analgesic requirement do not differ significantly whether bupivacaine is infiltrated before incision or just before closure of wound.
Keywords: Postoperative pain, bupivacaine, rescue analgesia, Preincision

INTRODUCTION

Pain is the most common and most difficult problem faced by patients after operation. Due to inadequate management 30-70% patients suffer from post-operative pain[1]. Most common concern (59%) of patients scheduled for surgery is postoperative pain. Even in USA 75% patients experience postoperative pain. Ineffective postoperative management have negative clinical implications including disrupted sleep, loss of morality, pneumonia, poor wound healing, deep venous thrombosis, myocardial infarction and pulmonary embolism. Acute pain resulting in chronic pain reduces quality of life and creates economic burden[2].
Various modes are being utilized for postoperative pain relief alone or in combination e.g. opoids as bolus, infusions or patient controlled analgesia, tramadol, NSAIDs, regional blocks. All have positive as well as negative implications[3]. Infiltration of local anesthetic site before incision is easy to perform, does not require technical skill and is inexpensive.[4]Administration of analgesics before a painful stimulus provides pain relief in much smaller doses than administration after painful stimulus. There are a large number of reports about chronic pain developing after surgical procedures[5].Although cause of chronic pain is not known exactly but it is considered to be a continuation of acute pain. Neuropathic pain results from structural or functional adaptation of central and peripheral nervous system to injury and hypersensitivity. In order to reduce pain any point in the nociceptive pathway can be targeted[1].

The interruption at the initial point of Nociceptive pathway is logically more appropriate providing preemptive analgesia by blocking fast sodium channels within the axon and preventing propagation of action potential. Surgical incision produces inflammatory response which sensitizesnociceptive receptors resulting in pain and hyperalgesia is inhibited by infiltration of local anesthetics[6].

Pre emptive analgesia has been observed in various procedures like tonsillectomy, cholecystectomy, hysterectomy and orthopedic operations[7]. It will attenuate peripheral and central sensitization. Phantom limb pain is an entity due to engraving pain in central nervous system. Measures taken against nociceptive stimulus before their implications may interrupt signals and prevent structural or functional adaptation of central or peripheral nervous system.

Although large number of studies are available on infiltration of local anesthetics after completion of surgical procedures and just before wound closure but the results were inconclusive. Comparison between infiltration before incision and near completion of procedures are scarce and with variable results. Although meta-analysis and systemic reviews of various studies did not favour the concept of preemptive analgesia but conclusion after a few comparative studies was not justified. Moreover, selected studies compared infiltration of local anesthesia with normal saline or none but not with the infiltration of local anesthesia near completion of procedure[8].Similarly, studies of infiltration of local anesthetics compared with normal saline before incision provided variable results[7, 9]. So we aimed to try to compare Preincision infiltration with infiltration near closure to fill the gap of inadequate number of trials.

Primary objective of our study was to compare post-operative pain relief between infiltration of 0.25% bupivacaine into skin and subcutaneous tissue in the line of incision before incision and along edges of wound near completion of procedure.
Our secondary objective was to evaluate the time interval between completion of procedure and patient demands analgesic (rescue analgesia).

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MATERIAL AND METHODOLOGY

This randomized controlled study was conducted in Department of Anesthesia, Sughra Shafi Medical Complex / Sahara Medical College Narowal in patients aged 12 -80 years of either sex undergoing open abdominal surgical procedures (open cholecystectomy, appendectomy, Hernioplasty, exploratory laparotomy, total abdominal hysterectomy) were included in the study.

Patients with known hypersensitivity or contraindications to study drug, Patients with mental illness (history/medical record), Patients with communication difficulties and pregnant patients were excluded from study.

Routine preoperative assessment was done one day before the operation. Patient was educated about pain and visual analogue scale and written informed consent was taken. On the day of operation patients were randomized in two groups (Group P and Group C) by closed envelope containing 32 slips of each group.With non-invasive monitoring (Heart rate, systolic and diastolic blood pressure, Mean arterial pressure, oxygen saturation, Electrocardiogram) pre-operative vital signs were recorded in operation theatre. Intravenous line with 18 G cannula was passed. Ringer Lactate intravenous infusion was started. After adequate pre-oxygenation, induction was accomplished by using intravenous injection nalbuphine 0.1mg/kg, injection propofol 2mg/kg and injection suxamethonium 1-1.5mg/kg or atracurium 0.5mg/kg in both the groups. Endotracheal tube of suitable size was passed and patient maintained on intermittent positive pressure ventilation with tidal volume 7ml/kg and respiratory rate 12 breaths per minute. General anesthesia was maintained with 40% O2, 60% N2O and 1-2MAC Isoflorane. After maintaining anesthesia patient was prepared and draped. The surgeon was requested to infiltrate 0.25% bupivacaine (ranging from 6 ml to 30 ml depending upon the expected length of incision) at the site of incision into skin and subcutaneous tissue in Group P and 0.25% bupivacaine in same volume along the edges of wound at near closure of procedure in Group C. In Group P surgeon was asked to wait for 2-3 minutes after infiltration of local anesthetics to allow onset of action. At the end of surgery Injection neostigmine 0.04mg/kg and atropine 0.02mg/kg were given to reverse the neuromuscular blockade. After maintaining adequate spontaneous ventilation patients were extubated and shifted to Post Anaesthesia Care Unit. Intensity of pain was assessed on visual analogue scale in the recovery room, 3, 6 and 24 hours postoperatively which ranged from 0(no pain) to 10 (worst pain). The time of first dose of rescue analgesia within 24 hours was also noted in both groups.

The sample size was calculated from open Epi, version 3, open source calculator by taking mean Visual Analogue pain score at 24th hours post appendectomy, 3.1591±0.7134 in Preincision group versus 3.75±0.943 in post procedure infiltration of previous study keeping power of the test 80% and level of significance 95%.[10]

Statistical analysis: The collected data was entered to SPSS version 20 and was analyzed. Tables were used to represent the results. The Quantitative variable like age, duration of operation, VAS and time of first dose of rescue analgesia between two groups were compared by independent student t test. The Qualitative variable like gender was compared by chi square test. P-value <0.05 was considered statistically significant.

RESULTS

The total number of patients in Group P and Group C were 64(32 in each group), comprising of 8 (25%) males and 24 (75%) females in Group P and 6 (18.75%) males and 26(81.25%) females in Group C.

The mean age of patients in Group P and C was 41.06 ±15.64 and 36.94 ±17.48 years. The mean duration of operation in Group P and Group C was 57.03±29.43 and 71.41±56.79 minutes. In demographic data regarding age, gender and duration of operation the differences between two groups were not statistically significant (Table 1).

The mean visual analogue pain score in Group P and Group C in recovery room was 6.25±1.74 and 6.00±1.91 (p value=0.587).The mean visual analogue pain score in Group P and Group C at 3 hours postoperatively was 4.40±1.72 and 4.53±1.29 (p value=0.744).The mean visual analogue pain score in Group P and Group C at 6 hours postoperatively was 3.21±1.43 and 3.03±1.35 (p value=0.592).The mean visual analogue pain score in Group P and Group C at 24 hours postoperatively was 1.94±1.37 and 1.75±0.91 (p value=0.521).The means of visual analogue pain scores during all observed periods were not statistically significant between two groups (Table 2).

The mean time of rescue analgesia in Group P and Group C in minutes was 318.12±149.47 and 374.84±125.67 respectively (p value =0.105) (Table 2), hence difference was not statistically significant. Open surgical procedures included in the study were open cholecystectomy, appendectomy, Hernioplasty, exploratory laparotomy and total abdominal hysterectomy (Table 3).

Table 1: Demographic data

	Group P	Group C	P –value
Age (years)	41.06±15.64	36.94±17.48	0.324
Duration of operation(minutes)	57.03±29.43	71.41±56.79	0.208
Gender (Chi- Square Test)			
Males	8(25%)	6(18.75%)	0.545
Females	24(75%)	26(81.25%)	0.763

Table 2: Visual analogue score and time of resue analgesia

	Group P	Group C	P- value
VAS Recovery room	6.25±1.74	6.00±1.91	0.587
VAS at 3 Hours	4.40±1.72	4.53±1.29	0.744
VAS at 6 Hours	3.21±1.43	3.03±1.35	0.592
VAS at 24 Hours	1.94±1.37	1.75±0.91	0.521
Time of rescue analgesia in minutes	318.12±149.47	374.84±125.67	0.105

Table 3: Surgical procedures

Surgical procedure	Group p	Group c	Total
Open cholecystectomy	11	9	20
Appendectomy	5	9	14
Hernioplasty	4	6	10
Exploratory Laparotomy	10	4	14
Total abdominal hysterectomy	2	4	6
Total	32	32	64

DISCUSSION

Adequate postoperative analgesia is an essential requirement by patients and can also enhance the clinical outcome. Local anesthetic wound infiltration is simple and economical means of administering good analgesia.

In our study, there was no statistically significant difference in postoperative pain relief and demand of rescue analgesics between two groups.

Our study results has been favored by some studies while other studies concluded that infiltration of bupivacaine before incision (pre-emptive) provided better postoperative analgesia than infiltration near closure of wound (preventive).

J K Randall et al found no significant difference in mean pain scores between pre and post incision infiltration of bupivacaine at 1st, 4th and 8th hour post appendectomy similar to our study[11].

In another study by Mehrdad H et al there was also no significant difference in mean pain scores between pre and post incision bupivacaine at 12, 24 and 48 hour after surgery. There was also no statistical difference between group 1&2 regarding the time for rescue analgesia i.e. 5.7±3.9 and 5.8±3.5 hours respectively. The results of this study were similar to our study[12].

Setharaman H et al conducted a study to analyze the effect of infiltration of local anesthetic on postoperative pain relief. Mean visual analog pain score readings were recorded at 1,4,12 and 24

hours postoperatively. There was no statistical significant difference in intensity of pain between any groups. The total dose of morphine used by patients who received preoperative and postoperative local anesthetic infiltration was not statistically significant same as in our study.[13]

Moiniche and his associates reviewed 80 RCT's to find out the effect of pre and post-operative analgesia on pain score within first 24 hours after operation treated with peripheral local anesthetic infiltration, NSAIDS, epidural analgesia, systemic opioids or NMDA receptor antagonists. They found that the preincisional administration of analgesics is not superior to post incisional, hence favoring the results of our study.[14]

Ong et al reviewed 66 RCTS on preemptive analgesia for post-operative pain by using 5 types of analgesic interventions (NSAIDS, epidural, NMDA receptor antagonist, opioids and local infiltration). Study parameters were to find the pain intensity scores during first 24-48 hours, time to first recue analgesia and total supplemental analgesic requirement. They analyzed that the preemptive local anesthetic infiltration improved the time to first rescue analgesia and the total analgesic consumption which is against our study but found no improvement on postoperative pain score which is similar to our study.[15]The disparity between the outcomes of Moiniche et al and Ong et al may be due to divergent inclusion criteria of selected studies or different approach for determination of pain scores.

Joseph T et al in their study found no significant difference in Post Anaesthesia Care Unit regarding pain scores between pre and post incisional bupivacaine cohort groups (p value =0.74) which is same as our study but they also found that the PACU exit pain score (p value=0.04) and mean PACU pain score (p value = 0.009) was significantly lower in the Preincision cohort group different from our results[16]. This difference may be due to by only taking thumb surgeries or less sample size.

Rumman K and his associates performed a study to compare the effectiveness of bupivacaine before and after incision for pain in patients undergoing appendectomy at 24hours after operation. They found that the mean pain in group A & B after 24hours was 3.1591±0.7134 and 3.7500±0.943 respectively (p value=0.0013) which was statistically significant and in contrast to our study. This disparity may be due to small incision of appendectomy, taking only one reading after 24hours or taking only appendectomy patients.[17]

Shahzada Gani et al conducted an observational study to evaluate the effect of intra peritoneal instillation with 0.5% ropivacaine as pre insufflation and at the time of closure in patients undergoing laparoscopic cholecystectomy. The mean VAS score for group A&B were 2.5±1.2 &5.2±2.9 (p value=0.0001) respectively which is significantly lower in group A who received ropivacaine as pre insufflation. The first analgesic rescue dose requirement was also longer in group A i.e. 6.25 hours than group B i.e.4.50hours (p value=0.0003) which is statistically significant and opposite to our study.[18] May be the results differed from our study due to small incision of laparoscopic cholecystectomy which results in less postoperative pain as compared to open cholecystectomy and the concentration of the drug 0.5% which they used as compared to ours (0.25%).

While comparing various studies, we observed pre-emptive administration of analgesics provides better pain relief than preventive administration of analgesics.[19] However, no statistically significant difference in postoperative pain relief was observed between preemptive and preventive administration of analgesics requiring larger incisions[20,21,22].

The limitations of our study include small sample size, conducted only at a single center. To adequately test the efficacy of this intervention further clinical trials are required on larger population.

CONCLUSION

Postoperative analgesia and analgesic requirement do not differ significantly whether bupivacaine is infiltrated before incision or just before closure of wound.

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