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Mohammad Irfan Akhtar
Aga Khan University

Mohammad Saleem
Railway Hospital Rawalpindi

Jawad Zaheer
Holy Family Hospital Rawalpindi

Original Article

Wound infiltration with Bupivacaine versus Ketorolac for postoperative pain relief in minor to moderate surgeries

Mohammad Irfan Akhtar,[1] Mohammad Saleem,[2] Jawad Zaheer[3]

Anaesthesia Department, Aga Khan University Hospital, Karachi,[1] Anaesthesia Department, Railway Hospital Rawalpindi,[2] Anaesthesia Department, Holy Family Hospital Rawalpindi.[3]

Abstract

Objective: To compare the analgesic efficacy of Bupivacaine 0.25% wound infiltration with Ketorolac incisional infiltration in relieving postoperative pain for first twenty-four hours.

Methodology: Analytical, interventional and comparative study was performed on seventy patients, of both sexes, with varied age groups. Patients underwent minor and moderate surgeries, confined to American Society of Anaesthesiologist ASA category 1-II. Patients were selected by convenience sampling and were divided into two groups i.e. Group I and Group II. Group-I comprised of thirty five patients and were infiltrated with Bupivacaine 0.25% at wound margins postoperatively. Group-II also comprised of thirty-five patients and were infiltrated with Ketorolac at wound margins 60mg postoperatively.

Results: Bupivacaine 0.25% wound infiltration had onset of action within 4±2 minutes. Percentage pain relief was 80% in minor surgeries and 60% in moderate surgeries. Duration of action lasted for 8±2 hours regarding minor surgeries while it was 6±1 hours for moderate surgeries. Ketorolac incisional infiltration had onset of analgesic action within 10±5 minutes. Duration of action lasted for 6±1 hours regarding minor surgeries while it was 4±2 hours regarding moderate surgeries. Percentage pain relief was 60% in minor surgeries and 50% in moderate surgeries.

Conclusion: Wound infiltration with Bupivacaine 0.25% was better for postoperative pain relief in comparison with Ketorolac regarding percentage pain relief, onset and duration of action (JPMA 59:385; 2009).

Introduction

Pain is a complex but an important protective phenomenon. It may be defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.[1] Good postoperative pain relief is important as it alleviates patient's distress and helps in rapid uncomplicated recovery. It also reduces the stress response to surgery, which is very important for patients with compromised cardiovascular respiratory functions.

Pain has been a constant companion of the human race since time immemorial. To alleviate their suffering people tried different methods, one of them being chewing leaves of different plants for their analgesic effects. One of the plants commonly used was the poppy, (Papaver somniferum). Poppy is the source of opium, the crude substance and morphine, its purified constituent. The plant may have been in use for over 6000 years and there are accounts of its use in ancient Egyptian, Greek and Roman documents.[2]

Acetylsalicylic acid was synthesized in 1853, but the drug was not used until 1899, when it was found to be effective in arthritis and well tolerated. It was named 'Aspirin'. Because of its greater efficacy and low cost. Aspirin rapidly replaced the natural products then in use and has remained one of the most widely employed remedies for over 90 years. Since the last few years the medical profession has come to the conclusion that its capacity for providing adequate analgesia is severely flawed. The publication of the Joint Colleges Report on 'Pain After Surgery' came not only as a hearty shock, but also served to encourage many, especially anaesthesiologists, to pay attention to the shortcomings of analgesia and pain relief services, at least in the acute, post surgical area.[3] Advances have been made in pain management due to better understanding of the physiology, biochemistry, the genetics of pain, and better knowledge about the analgesic agents. The alleviation of postoperative pain is primarily provided for humanitarian reasons and to reduce nociception-induced responses, which may adversely influence organ functioning and contribute to morbidity.[4]

Pain is a subjective phenomenon, which may be described in terms of its location, intensity, duration and its impact on the sufferer. After surgery, patient may complain directly related to the site of surgery or coincidentally from other sites. Spontaneous or forced movement may precipitate pain from parietal tissues, as

for example by coughing or deep breathing following abdominal surgery.

The purpose of the study was to compare the analgesic efficacy of Bupivacaine 0.25% with ketorolac wound infiltration in minor to moderate surgeries.

Operational Definitions:

Analgesic efficacy: Analgesic efficacy is defined in terms of onset of action, duration of action and percentage pain relief.

Minor surgeries: Henia repairs, Appendicectomies.

Moderate surgeries: C-Sections,Cholecystectomies.

ASA-I: Fit healthy patient.

ASA-II: A patient with mild systemic disease and no functional limitation.

Patients and Methods

This analytical, interventional and comparative study was conducted at a tertiary care hospital, after approval from the ethical committee of the hospital. Informed written consent was taken from all the patients included in the study.

Inclusion Criteria were, ASA I-II patients undergoing elective or emergency minor to moderate surgeries and different age groups (20-50 years) belonging to both sexes.

The Exclusion Criteria were, patients allergic to amide local anaesthetics and patients having history of acid peptic disease, renal dysfunction and bleeding diasthesis.

A total of seventy patients were selected by convenience sampling, who had to undergo minor to moderate surgeries. All were randomly allocated to the two groups (group I and group II). Both anaesthetist and surgeon were blinded to the infiltration solution.Only the staff nurse knew the group and the solution to be infiltrated .The infiltration solution composition and volume is described below.

Group I: Thirty five patients were included in this group. These patients were infiltrated with injection Bupivacaine 0.25% (diluted in 7.5 ml saline to make a volume of 15ml) at the wound margins at the end of surgery.

Group II: Thirty five patients were included in this group. These patients were infiltrated with injection Ketorolac 60mg (diluted in 13ml saline to make volume of 15 mls) at the wound margins at the end of surgery.

All the patients were assessed preoperatively and were explained about the analgesic technique to be employed postoperatively. They were premedicated with Tab midazolam 7.5mg per oral half an hour before coming to operating room. All patients were given general anaesthesia after establishment of mandatory monitoring (ECG, NIBP, SPO2., Temperature). Same general anaesthetic technique was adopted in all the patients. After preoxygenation with 100 % O2, patients were induced with pentothal 4-5 mg/kg, fentanyl 2-3 mics/ kg and were intubated with succinylcholine. Lignocaine 1-1.5 mg/kg I/V was used to blunt the intubation response. Rapid sequence technique was used for emergency and C-sections.Anaesthesia was maintained with isoflorane and O_2 (30%) nitrous cxide (70%) mixture and increments of atracurium. All were infiltrated with 1% xylocaine at the wound margins for intraoperative pain relief prior to incision. An indwelling catheter was placed between the wound layers to allow intermittent infiltration of the wound in the postoperative period for 24 hours. These patients were assessed for pain in the ward, and analgesia was given in the form of wound infiltration (either Bupivacaine for Group-I patients and ketorolac for Group-II patients) through indwelling catheter when the pain score was more than 1 on the pain score proforma. The extent of pain, time of onset of analgesic action, percentage pain relief and duration of analgesic action was recorded on the pain assessment proforma. The parameters used to assess the onset of analgesia were subjective feeling of pain and objective parameters like heart rate, blood pressure and respiratory rate. Sleep pattern was also included as criteria for percentage pain relief i.e. patient sleep pattern altered means moderate pain and inability to sleep indicates severe pain, as shown on the attached proforma.

Injection tramadol 50mg I/V was used as rescue analgesia. These two groups were compared with respect to the onset of analgesia, duration of analgesia, percentage pain relief, age, sex and type of surgery (whether minor or moderate).

Data Analysis Procedure:

SPSS version 16 was used and Chi-square test was applied to draw our results about analgesic efficacy with the two groups. A p value $< .05$ was taken as statistically significant.

Results

After comparing the drugs of two groups with respect to onset and duration of action, it was found that onset of action was quicker with Bupivacaine 0.25% wound infiltration i.e. within 4±2 minutes and duration of action varied according to type of surgery. In cases of

minor surgeries, the duration of action was 8±2 hours, and in case of moderate surgeries duration of action was 6±1 hour. In group-II patients infiltrated with ketorolac, the onset of action was 10±5 minutes. Duration of action varied according to type of surgery. Patients undergoing minor surgeries remained pain free for 6±1 hour and those undergoing moderate surgeries were relieved of pain for 4±2 hours.

Pain relief was also better with Bupivacaine 0.25% i.e. 80% in minor surgeries and 60% in moderate surgeries. Regarding ketorolac, percentage pain relief was 60% for minor surgeries and 50% for moderate surgeries. The average consumption of Bupivacain was three to four ampules and for ketorolac it was 8-10 ampules.Cost of one ampule of bupivacaine and ketorolac is 19 Rs and 90 Rs respectively. Over twenty four hours,average consumption of bupivacaine was two to three ampules while for ketorolac it was four to five ampules (120-150mg), depending upon whether surgery was minor or moderate respectively. The maximum safe dose of bupivacaine is 1-1.5mg/kg.

Regarding the rescue analgesia usage there was no statistical difference.

Female patients were more sensitive to pain. The pain score for female patients was 3±0.5, while it was 2.5±0.5 for male patients on the proforma. Bupivacaine was found to be more effective regarding percentage pain relief, onset and duration of analgesia. Economically it was also accepted for two reasons, it was cheaper than ketorolac and less number of injections were needed for infiltration.

By applying chi-square test to our results about analgesic efficacy with the two groups, it was observed that Bupivacaine infiltration produced better pain relief as compared to ketorolac ($P < 0.05$).

Discussion

The methods of pain scoring include Verbal Rating Scale (VRSs), numerical rating scales (NRSs), visual analogue scales (VASs), and method used most commonly in Pakistan, the Pakistan Coin Pain Scale (PCPS).[5] These simple methods have been used effectively in hospital clinics and have provided valuable information about pain and analgesia.

Bupivacaine is a long acting local anaesthetic belonging to amide group. Maximum safe dose is 1.5 - 2 mg per kg body weight.

Toxicity is related to plasma level of unbound drug and is most likely to be seen after intra vascular injection. Appearance of convulsions may be the first sign of toxicity under such circumstanses. Cardiovascular toxicity is usually preceded by evidence of hypoxia associated with apnoea due to central depression, but some times fibrillation. Due to Bupivacaine high protein binding capacity, cardiac resuscitation is difficult due to strong binding with sodium channels in myocardial muscle.

The use of wound infiltration for postoperative pain relief is an attractive method because of the apparent simplicity, safety and low cost. For incisional analgesia either local anaesthetics or NSAIDs may be used.

In a recent qualitative systematic review 26 appropriately randomized and double-blind trials comparing incisional local anaesthetics with placebo or no treatment were identified using the Medline and Cochrane databases 1966-1997 and 1997 respectively and bibliographs of retrieved reports.[6]

All trials of hernia repair comparing Bupivacaine 0.25-0.5% 15-40ml, lidocaine 200mg, and Bupivacaine 0.25-0.5% 40 ml with placebo or no treatment, showed improved postoperative pain relief, as pain scores and analgesic consumption were reduced by 25-50% in all trials and time to first analgesic request was prolonged between 2-7 hours. Subsequently, a further two trials of Bupivacaine 0.25-0.75%, 30-40ml[7,8] and one trial of continuous intra-wound infusion of Bupivacaine 0.5%[9] have confirmed the positive results from the review.

In a systematic review of peripheral local anaesthetics after laparoscopic surgery port-site infiltration for postoperative pain relief was investigated in eight trials.[10] The NSAIDs mainly act peripherally because entry into the CNS is limited for most NSAIDs due to their protein binding, their polar nature and consequent low lipophilicity. A recent study has shown that opioid potentiation of descending inhibitory GABA nergic influences on nociceptive pathways in the mid-brain peri-aqueductal grey matter may itself be enhanced further by NSAIDs.[11]

Hence it is quite evident from the study that local infiltration either with local anaesthetic or some NSAID should be the part and parcel of the multimodel intraoperative and postoperative pain management.

Conclusion

Wound infiltration with Bupivacaine 0.25% was better than ketorolac incisional infiltration in relieving postoperative pain for first 24 hours because Bupivacaine had earlier onset, longer duration of action and better pain relief .It was also cost effective in comparison with Ketorolac.

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