Original Article

Postoperative analgesia after lumbar disc surgery: A comparison between ketorolac and opioid

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Abstract

Background *Most spinal surgery is painful and good postoperative analgesia is important. Opioids are the traditional first-line treatment. Ketorolac has been used for postoperative pain relief. However, there is no data available about controlling postoperative pain with ketorolac after open lumbar discectomy or laminectomy in Bangladesah.*

Objective *To compare the efficacy of a Parentral ketorolac with conventional opioid for management of postoperative pain after lumbar disectomy or laminectomy.*

Methods *Sixty patients who underwent lumbar disectomy or laminectomy were randomly allocated into two groups. Group A (n = 30) patients received 30 mg intramuscular ketorolac upon surgical closure and every 6 hours for 24 hours and intramuscular pethidine 1.5 mg/kg/b.w. as needed (PRN). Group B (n = 30) patients received only intramuscular pethidine 1.5 mgkg-1/b.w. every 6 hours for 24 hours and as needed (PRN). Postoperative analgesia was assessed in both groups by Visual Analogue Scale at arrival in postoperative ward and at 6, 12 and 24 hours for 24 hours. Total postoperative narcotic consumption and side effects like post operative nausea and vomiting (PONV), dizziness, urinary retention and pruritus were also recorded.*

Results *Baseline data were comparable between the two groups. The mean VAS almost similar and less than 3 at different reading in both groups which indicate adequate postoperative analgesia and the differences were statistically not significant. The mean total cumulative amount of pethidine administered over 24 hrs period was less in group A it was 64.31+19.13 mg where as in group B was 161.23+21.25 mg. and the difference was statistically significant ($p<0.01$). Incidences of side effects like PONV, urinary retention and pruritus were more in group B than group A and differences were statistically significant ($p<0.01$).*

Conclusion *For postoperative pain management after lumbar spine surgery both ketorolac and traditional parental opioid found effective. Total opioid consumption is significantly less with ketorolac and side effects like PONV, dizziness, urinary retention and pruritus were more with opioid alone.*

Keywords *Ketorolac, opioid, postoperative pain, lumar spine surgery.*

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Introduction

Many patients with lumbar spine surgery experience moderate to severe pain in the recovery room or postoperative period. Although opioids are the traditional first-line treatment,[1] the potential adverse effects often make physicians reluctant to increase the dosage to achieve adequate analgesia.[2] Nonsteroidal anti inflammatory drugs (NSAIDs) provide effective analgesia for acute pain after minor and major surgery as a substitute for or as an adjunct to opioid analgesia and reduces opioid requirement during postoperative period.[3-11]

The most recent parental non-steroidal anti-inflammatory drug available for control of postoperative pain is ketorolac, a pyrolizine carboxylic acid derivative, structurally related to indomethacin. Ketorolac inhibit both cyclo-oxygenase and lipooxygenase enzyme thereby preventing synthesis of both prostaglandin and leukotrienes, and may release endogenous opioids. These properties of ketorolac make it more potent than other non-steroidal anti-inflammatory drugs and it is used in the treatment of post-operative pain of moderate or severe intensity[12-16] The most common adverse effects reported with ketorolac include drowsiness, nausea, vomiting and dry mouth, but with no significant difference when compared to placebo.[17] The analgesic potency of ketorolac 30mg has shown to be comparable with morphine 10- 12 mg I/M. [18]

The postoperative pain requirements, however, depend on the type of procedure, size of skin incision and muscle dissection, and degree of bone involvement. Therefore, it is difficult to explorate the results of these investigations to other surgical procedures. Ketorolac has good analgesic potency and its opioid-sparing capacity. Because its onset of action is not immediate (about 30–60 minutes after IM injection), its use in severe acute pain in the postoperative period is best as an adjuvant to opioids, rather than as a sole agent for postoperative pain. This prospective randomized study was designed to assess the efficacy of a ketorolac with conventional opioid for the management of postoperative pain relief after lumbar disc surgery.

Methods

This randomized double blind prospective study was performed at BSMMU, Dhaka and Metropolitan Medical Centre, Dhaka in one calendar year from July 2009 to June 2010. After obtaining written informed consent from the patients, 60 ASA physical status I or II patients of either sex, aged 18-70 years scheduled for elective discectomy or decompressive laminectomy (1 or 2 levels) of the lumbar spine were included in the study. Patients with history of allergy, known or suspected to be drug abusers, renal diseases and history of peptic ulcer were excluded from the study. During the preoperative interview, patients were instructed how to assess postoperative pain by using the Visual Analogue Scale (VAS) 0-10, 0 = no pain, 10 = the worst imaginable pain.

Operation was done under general anaesthesia with controlled ventilation. All patients received oral diazepam (5 mg) at night surgery. Pethidine 1 mgkg-1 and diazepam 0.1 mg/kg-1 were slowly given intravenously before induction of general anesthesia. Induction was done with thiopentone 4-5 mgkg-1. After intubation with vecuronium 0.1 mgkg-1, anesthesia was maintained with 70% nitrous oxide in oxygen, halothane 0.5-1% and muscle relaxation was maintained with incremental doses of vecuronium. Patient's heart rate, blood pressure, respiratory rate and SpO_2 were monitored in every 5 minutes interval. After completion of operation the patients were extubated by reversal of muscle relaxant and then admitted to the postoperative ward for 24 hours.

All eligible patients were randomized in to two groups. Group A (n = 30) patients received 30 mg I/M ketorolac upon surgical closure and every 6 hours for 24 hours and IM pethidine 1.5 mgkg-1 b.w. as needed (PRN). Group B (n = 30) patients received only I/M pethidine 1.5 mgkg-1 b.w. every 6 hours for 24 hours and as needed (PRN).

Postoperative analgesia was assessed in both groups by Visual Analogue Scale (VAS). Observations were made in postoperative ward at arrival and at 6, 12 and 24 hours for 24 hours. Patient's heart rate, blood pressure, respiratory rate and SpO_2 were observed accordingly. Total postoperative pethidine consumption and side effects like post operative nausea and vomiting (PONV), dizziness; urinary retention and pruritus were also recorded.

All results were expressed in mean + SD or percentage as applicable. Statistical analyses were carried out using Statistical Package for Social Science (SPSS) for Windows Version 17.0. Results were considered statistically significant if P value less than 0.05.

Results

Patient's demographics and types of operation performed were similar and fairly comparable in both groups and differences were statistically not significant (Table I). Duration of surgical procedure and duration of anaesthetic procedure were similar

in both groups and differences were statistically not significant (Table I). No patient was withdrawn from the study. Operating conditions were pronounced satisfactory by the surgeon concerned in all the cases.

Table I *Demographic and operative patient data*

Characteristics	Group A (n=30)	Group B (n=30)	P Value
Age (Years)	48.7+10.1	49.1+10.3	0.564 NS
Body weight (Kg)	59.4+8.2	60.2+7.9	0. 579 NS
Height (Cm)	155.25+3.49	153.65+4.04	0.087 NS
Sex			
Male	20(66.66%)	19(63.34%)	0.768 NS
Female	10(33.34%)	11(36.66%)	0.789 NS
ASA physical status			
I	17(56.66%)	18(60%)	0.776 NS
II	13(43.44%)	12(40%)	0.784 NS
Types of operation			
Discectomy	16(53.33%)	15(50%)	0.812 NS
Laminectomy	14(47.67%)	15(50%)	0.797 NS
Duration of Surgry(min)	107.9+17.3	108.2+16.7	0.836 NS
Duration of Anaesthesia(min)	119.6+22.8	121.3+23.1	0.821 NS

Values are expressed in Mean + SD and P value <0.05 are significant
NS– Not significant

The pain intensity was measured by visual analogue scale in both groups. Statistical analysis revealed no significant difference in pain severity at arrival in postoperative ward and at 6, 12 and 24 hours (Table-II). The mean VAS almost similar and less than 3 at different reading in both groups which indicate adequate postoperative analgesia was maintained in both groups.

The mean total cumulative amount of pethidine administered over 24 hrs period following the end of surgery was less in group A compared to group B. Mean dose of pethidine in group A was 64.31+19.13 mg where as in group B was 161.23+21.25 mg. and the difference is statistically significant P<0.01 (Table III). Incidence of postoperative side effects like PONV, dizziness, urinary retention and pruritus were recorded and shown in (Table-IV).). Incidence of PONV, urinary retention and pruritus were more in group B than group A and differences were statistically significant (p<0.01). Dizziness was also more in group B than group A but difference was statistically not significant.

Table II *Mean pain score (VAS) after surgery*

Measurement time	Group A (n=30)	Group B (n=30)	P Value
After surgery	2.68+1.8	2.71+1.7	0.251 NS
After 6 hours	2.79+1.5	2.89+1.6	0.089 NS
After 12 hours	2.69+1.7	2.76+1.6	0.098 NS
After 24 hours	2.27+1.4	2.31+1.5	0.213 NS

Values are expressed in Mean + SD. Test are done by unpaired student 't' test

NS– Not significant

Table III *Mean total dose of pethidine administered over 24 hours period following surgery*

Variable	Group A (n=30)	Group B (n=30)	P Value
Mean dose of pethidine (mg)	64.31+19.13	161.23+21.25 S	P<0.01

Test done by chi-square test, Values are expressed in Mean + SD, P < 0.01 – Statistically significant

Table IV *Incidence of side effects during postoperative period*

Side effects	Group A (n=30)	Group B (n=30)	P Value
PONV	1(3.33%)	5(16.66%)	P<0.01 S
Dizziness	2(6.66%)	4(13.33%)	P<0.061 NS
Urinary retention	1(3.33%)	5(16.66%)	P<0.01 S
Pruritus	1(3.33%)	4(13.33%)	P<0.01 S

Values are expressed in Percentage. Test are done by chi-square test
P < 0.01 – Statistically significant
NS– Not significant

Discussion

Opioids remain the mainstay for postoperative analgesia, especially following major surgery. Pain, however, is a multi-factorial phenomenon that cannot be controlled adequately with simple monotherapy with opioids alone. [19] Furthermore, opioid use is associated with dose-related adverse effects such as respiratory depression, nausea, vomiting, urinary retention, itching, and sedation. Opioids also reduce gastrointestinal (GI) motility, which may contribute to postoperative ileus. [20,21]Their ability to control pain on movement also is limited, which may delay early mobilization and aggressive postoperative rehabilitation. [22] To improve pain relief, and reduce the incidence and severity of adverse effects, a multi-modal approach to postoperative analgesia should be used. It is well known that spine surgery patients report high-severity postoperative pain.[23, 24] Several studies have investigated risk factors for postoperative pain after spine surgery. These include psychologic, social profile, and preoperative pain severity. [25-28] The use of minimally invasive neurosurgical techniques may decrease the occurrence of significant postoperative pain, [29,30] but these techniques are not widely performed. The typical spine surgery patient has endured back pain chronically, with a good number of them on long-term pharmacologic analgesic therapy, sometimes requiring very large doses of analgesics and narcotics.

In this study we examined the effectiveness of a intramuscular ketorolac for treatment of postoperative pain after discectomy or decompressive laminectomy of the lumbar spine in the postoperative period. We also compare effectiveness with conventional intramuscular pethidine. The pain intensity was assessed using visual analogue scale (VAS). The mean VAS was less than 3 in both groups during different time periods during postoperative period, which indicate adequate postoperative analgesia was maintained in both group. Reports from several studies promote the use of NSAIDS in the perioperative period, but scarce information exists on their use for postoperative analgesia after spine surgery. Different routes of administration, different dosing regimens, and different drugs within this group have been studied. Le Roux et at reported that the use of NSAIDS as the sole medication for pain control after spine surgery was not sufficient to provide adequate analgesia, [31] but when combined with opioids, the combination results in much better results than with either one alone. [31-34] Reuben SS et al reported NSAIDS has opioid sparing effect for postoperative pain management after spine surgery. [35]

Ketorolac, given IM or IV, is the most investigated drug among the NSAIDS. It has good analgesic potency and its opioid-sparing capacity has been well documented. [31-33] Turner DM et al reported ketorolac has provided good analgesia after lumbar spine surgery and less opioid requirement as well as it was cost effective. [34] Because its onset of action is not immediate (about 30–60 minutes after IM injection), its use in severe acute pain in the postoperative period is best as an adjuvant to opioids, rather than as a sole agent. There is also a concern regarding the deleterious effects of NSAIDS on bone healing, because of the importance of PGE2 in the early stages of bone healing. [36]High-dose (120–240 mg/d), but not low-dose, ketorolac has been associated with nonunion following spine fusion surgery. [37]Low-dose ketorolac, in the absence of contraindications, may be a safe and effective adjuvant to an opioid-based regimen for acute postoperative pain management after spine surgery.

In this study cumulative narcotic doses were significantly lower with ketorolac ($P<0.01$). Reuben SS et el reported non-steroidal anti-inflammatory drugs have been found to enhance analgesia by reducing pain scores and reducing the amount of morphine used for analgesia. [38] Sevarino FB et al has been shown that intramuscular ketorolac when combined with opioids, the combination results in much better results than with either one alone. [39] Various studies conclude that both ketorolac administered was effective in reducing morphine consumption as rescue analgesic postoperatively.[40-42]

Incidence of postoperative complications like PONV, dizziness, urinary retention and pruritus were observed in both groups. Incidences were more with pethidine then with ketorolac and differences were statistically significant ($P<0.01$) regarding PONV, urinary retention and pruritus. These side effects such as nausea, vomiting, urinary retention, itching were associated with dose-related opioid use.

For management of postoperative pain following lumbar spine surgery ketorolac, when used with as needed narcotics (PRN) is effective like parental traditional opioid administration. The total opioid consumption is significantly less with ketorolac. Both the techniques were found effective and acceptable. But regarding side effects like PONV, dizziness, urinary retention and pruritus were more with opioid alone.

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