Efficacy of Preemptive Caudal Analgesia in Single Level Lumbar Spine Decompression and Fusion Surgery

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ABSTRACT

AIM: To evaluate the preemptive analgesic effect and duration of postoperative analgesia of caudal morphine bupivacaine in single level lumbar decompression and instrumented posterolateral Inter transverse spinal fusion (PLITF).

MATERIAL AND METHODS: A double blind prospective study on seventy eight patients scheduled for single level lumbar spinal decompression and Instrumented posterolateral Intertransverse spinal fusion (PLITF). Patients were divided into three equal groups and were given caudal injection either 30 ml saline or 30 ml of 0.25% bupivacaine or 2mg preservative free morphine added to 30 ml 0.25% bupivacaine. Time to 1st analgesic requirement, total diclofenac and pethidine requirements with timing of patient ambulation, patients satisfaction, VAS, and adverse effect were recorded.

RESULTS: Bupivacaine morphine showed prolonged time to 1st analgesic requirement, less intraoperative fentanyl, total diclofenac and pethidine consumption. Timing to ambulate the patients was shortest in the bupivacaine morphine group with minimal adverse effects.

CONCLUSIONS: Pre-emptive caudal bupivacaine morphine in single level lumbar decompression and instrumented posterolateral inter transverse fusion surgery provides prolonged postoperative duration of analgesia with less NSAIDs and pethidine analgesic requirements -both intra and postoperative- with earlier patients ambulation without occurrence of any hemodynamic changes or increased incidence of adverse effects.

KEY WORDS: Caudal analgesia, Instrumented lumbar fusion, Lumbar fusion, Posterolateral intertransverse spinal fusion, Preemptive analgesia

INTRODUCTION

Prolonged pain transmission from periphery to the central nervous system (CNS) might lead to neuroplasticity and hypersensitivity of CNS which results in a prolonged and pronounced pain perception, even after cessation of the noxious stimulus, the so called central sensitization (45).

Analgesia before the onset of pain, that is, preemptive analgesia, prevents this cascade, hence gives more effective pain relief (5,24, 26-28,44- 46). Patients undergoing lumbar spine surgery experienced severe and prolonged postoperative pain which may increase the incidence of postoperative complications as delayed wound healing and or greater risk of developing thromboembolism due to immobility (14). It is known that adequate levels of general anesthesia with a volatile drug such as isoflurane do not prevent central sensitization (17), thus the potential for central sensitization exists even in unconscious patients who appear to be clinically unresponsive to surgical stimuli. Therefore preemptive analgesic strategies should involve interventions at one or more levels along the pain pathway (1, 2, 23, 25, 26, 37, 41-43).
In spite of all proceedings in recognition of pathophysiology of pain, pharmacology of analgesics and development of advanced techniques in control of pain, postoperative pain is still a major issue in patient care (4).

Bupivacaine is an amide local anesthetic with a slow onset and long duration of action (4-8 hours). It binds to the intracellular portion of sodium channels and blocks sodium influx into nerve cells, which prevents depolarization, leading to impairment of the generation of action potential (34).

With the discovery of the opiate receptors in brain and substantia gelatinosa of the spinal cord, it was found that very small doses of opiates placed in the extradural space are able to cross the meninges and produce analgesia by acting on the spinal fluid. Analgesia from morphine is mediated by binding pre and postsynaptic mu-opioid receptors in the substantia gelatinosa of the dorsal horn of the spinal cord. Activation of presynaptic receptors on primary afferent neurons carrying nociceptive information results in decreased conductance through voltage-gated calcium channels and reduced calcium influx with subsequent decreased neurotransmitter release. This reduces signaling between primary and secondary afferent neurons in the dorsal horn. Binding of postsynaptic opioid receptors on secondary afferent neurons results in hyperpolarization and decreased propagation of action potentials (34).

The administration of a local anesthetic and opioid mixture (balanced analgesia) may improve pain relief through synergism and reduce drug-related side effects (24). Single shot caudal injection given at least 20 minutes before surgical incision is relatively simple, safe and effective method for obtaining post-operative pain relief; as local anesthetic gets fixed to the nerve root in about 20 minutes and effectively prevents the perception of nociceptive stimulus (7). This prevents CNS neuroplasticity and allows satisfactory pain relief in the first 24 hours after surgery (24, 45, 46).

The patients' rapid ambulation is of utmost importance to both the patient and surgeon. The outcome of spinal fusion surgery is greatly affected by the ability to rapidly ambulate the patient in the post-operative period, a maneuver that is greatly affected by post-operative pain control, and failure to do so could have dangerous consequences on patients' general health and increase the rate of complications. Sufficient post-operative analgesia is very important to achieve the goal of rapid post-operative ambulation.

The data available is too scarce to prove and evaluate the efficacy of preemptive caudal morphine in providing post-operative analgesia after single level lumbar decompression and instrumented posterolateral spinal fusion; therefore our primary objective was to evaluate the preemptive analgesic effect and duration of postoperative analgesia of caudal morphine bupivacaine in single level lumbar decompression and instrumented posterolateral intertransverse spinal fusion (PLITF).

We had other secondary objectives to look at, namely evaluating the changes that might occur due to the caudal analgesia in hemodynamic parameters, narcotic and anesthetic requirements, timing for first rescue analgesia, and adverse effects if any.

**MATERIAL AND METHODS**

After obtaining our university hospital ethical committee approval and written informed consent, 78 ASA I, II adult patients, aged between 26 and 70 years scheduled for single level lumbar spinal decompression and instrumented posterolateral intertransverse spinal fusion (PLITF) with titanium pedicle screws and rods fixation systems and posterior iliac crest auto grafting were enrolled in a double blind (treating team and the patients) prospective randomized study from March 2011 to July 2012.

Exclusion criteria consisted of the following high risk groups (ischemic heart disease, heart failure, severe aortic and mitral valve disorders, untreated hypertension, cerebral infarction, renal dysfunction) atopic patients, history of long-term medications of corticosteroids and treatment of anticoagulants. Patients with previous back surgeries, those who were receiving opioid analgesics medications in the preoperative period or those who had contraindications to regional anesthesia or were allergic to the used drugs were all excluded.

During the preoperative visit, all patients were made familiar of how to use the visual analogue scale (VAS) where 0 was designed as to mean there was no pain and 10 was the maximal worst pain. Before induction, all patients were pre-medicated with 3-5 mg I.V midazolam and preloaded with 500 ml ringer lactate; this was followed by a baseline mean arterial blood pressure and heart rate recording.
After application of standard monitor, anesthesia was induced by 1 μg/kg fentanyl, 3–5 mg/kg sodium thiopental, and cisatracrium (0.15 mg/kg). After intubation, the patients were ventilated with a mixture of 40% oxygen in air and 0.5 – 1.5% isoflurane and cisatracrium was given at a dose 0.03 mg/kg for maintenance. Patients were placed in the prone position on a Relton Hall frame or padded bolsters. A 21 gauge hypodermic needle was then introduced into the caudal epidural space after sterilization by povidone iodine 10%. Accurate placement into the space was verified by the whoosh test which was performed by injecting air through the needle and auscultation for the sound produced with the help of stethoscope placed over the lumbar spine (13). After negative aspiration of blood and cerebrospinal fluid, the drug was introduced into the caudal epidural space, and during injection any swelling over sacral area due to extravasations of the drug in the soft tissues was ruled out by careful inspection and palpation of the area. The patients were allocated randomly by a sealed envelope technique into three equal groups (26 each): Saline Group (S) was given 30 ml saline; Bupivacaine Group (B) was given 30 ml of 0.25% bupivacaine, and Bupivacaine Morphine group (BM) where 2 mg preservative free morphine was added to the 30 ml 0.25% bupivacaine. All the mixtures of the studied drugs were prepared by an anesthesia resident not involved in patients and data follow up. All caudal blocks were performed by the same anesthesiologist (the first author) who was blinded to the contents of the syringes and the site of injection was covered by steripad.

Hemodynamics as mean arterial blood pressure (MABP), heart rate (HR), and oxygen saturation (SPO$_2$) were recorded after induction and before caudal injection and every 20 minutes till the end of the operation. End tidal concentration of isoflurane was assessed every 20 minutes till the end of the operation too. Dose adjustment of isoflurane concentration and intraoperative fentanyl consumption were based on clinical signs and hemodynamic measurements as signs of inadequate analgesia were defined as increase in HR and MABP>20% from base line. This was treated by 1 μg /kg of fentanyl as top-up doses and increasing isoflurane concentration in case of inadequate response to fentanyl. Total amount of intra operative fentanyl consumption were also recorded.

If there was a decrease in MABP>20% from base line, the patient received a 500 ml saline infusion, and if no response 5 mg ephedrine would be given. If HR decreased to 45 beats/minute, atropine 0.5mg was given.

At the end of the surgery, residual muscle paralysis was antagonized by a mixture of 0.01 mg/kg atropine and 0.05 mg/kg neostigmine. In the post-operative period, after full recovery (Modified Aldrete score of 9-10), another anesthetist who was blinded to the patients’ group assignment, assessed the post-operative pain using VAS starting from 0 (patient’s full recovery in the post anesthesia care unit (PACU)) then at 1, 2, 4, 6, 12 and 24 postoperative hours.

Time to 1st post-operative analgesic need was defined as the time when the VAS was perceived by the patient to be 4 or more and the patient was given 75 mg diclofenac sodium IM and if no response after 30 minutes, 50 mg pethidine IM was given (with a maximum of one diclofenac dose/12 hr and a pethidine dose / 6 hrs). Total doses of diclofenac and pethidine consumption were recorded over the 1st 24 hours. Number of patients who received pethidine was recorded. Postoperative patient satisfaction score (as excellent, good, fair or poor) and timing of first mobilization of each group were recorded too. Intraoperative blood loss and duration of surgery (skin incision to skin closure) were recorded as well.

Postoperative side effects (nausea, vomiting, itching, urinary retention and respiratory depression) were treated. Nausea was treated by 10 mg metoclopramide i.v, Vomiting was treated by 4 mg Ondansatron i.v, Itching was treated by pheniramine maleate (45.5 mg/2 ml). We used i.v, urinary catheterization for urinary retention and oxygen mask 5 l/min with breath encouragement for respiratory depression (RR<8/minute).

**Statistical analysis:**

Statistical analysis of data was carried out using IBM SPSS version 18 (New York, USA). A sample size of 26 patients per group was required to have a power of 80% with an α level of 0.05. Data were expressed as mean ± SD, percentages (%), and numbers (n).ANOVA with POST hoc Tukey test was used to compare numerical variables between the three groups and χ² or Fisher’s exact test was used for categorical data. P-value less than 0.05 was considered statistically significant.
RESULT

The demographic data showed no statistical significant differences in the patient's characteristics as regards age, gender, ASA, height, weight and duration of surgery (Table 1).

Time to 1st analgesic requirement was significantly longer in bupivacaine morphine group (756.6 ± 192 min) when compared to either bupivacaine (439.8 ± 185.4 min) or saline groups (31.80± 7.2min). Also the time was longer in the bupivacaine group than that in the saline group. The total diclofenac consumption showed a statistically significant difference among the three groups, being highest in the saline group and lowest in bupivacaine morphine group.

Total pethidine consumption and number of patients requesting pethidine were statistically higher in saline group when compared to both bupivacaine and bupivacaine morphine groups (Table 2).

Hemodynamic parameters showed a similar decrease compare to their baseline values in the three groups.

Patient satisfaction score showed a statistical significant higher number of patients with excellent satisfaction in the bupivacaine morphine group and bupivacaine group than the saline group (Table 3).

Intraoperative blood loss was found to be similar in the three studied groups.

Isoflurane consumption showed a significantly higher percentage in the saline group (1.25±0.21%) than that in the bupivacaine (1.0±0.187%) and bupivacaine morphine groups (0.98±0.221%), but timing of ambulation was shortest in the bupivacaine morphine group (4.8±0.32hr), longer in the bupivacaine group (7.5±0.574 hr) and longest in the saline group (21.5±4.15 hr).

Total amount of intraoperative fentanyl consumption was not statistically significant between the bupivacaine (90±15.5 ug) and bupivacaine morphine group (78±11.3 ug).

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**Table 1: Demographic data, duration of surgery**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group (S) (n=26)</th>
<th>Group (B) (n=26)</th>
<th>Group (BM) (n=26)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>48.82±11.2</td>
<td>46.92±12.63</td>
<td>47.72±11.55</td>
<td>0.631</td>
</tr>
<tr>
<td>Gender (m/f) (n)</td>
<td>11/15</td>
<td>12/14</td>
<td>14/12</td>
<td>0.697</td>
</tr>
<tr>
<td>ASA I/II</td>
<td>16/10</td>
<td>18/8</td>
<td>17/9</td>
<td>0.842</td>
</tr>
<tr>
<td>Height(cm)</td>
<td>162.84±10.11</td>
<td>160.98±13.25</td>
<td>158.32±12.29</td>
<td>0.45</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>62.76±13.57</td>
<td>60.88±10.98</td>
<td>59.87±12.28</td>
<td>0.667</td>
</tr>
<tr>
<td>Duration of surgery(min)</td>
<td>130.21±24.79</td>
<td>115.31±30.8</td>
<td>100.48±20.82</td>
<td>0.055</td>
</tr>
</tbody>
</table>

Data are expressed as mean± SD, and number m/f: male/female

ASA: American Society of Anesthesiologists
S: saline B: bupivacaine BM: bupivacaine morphine.
P >0.05 was considered statistically non-significant between the three groups.

**Table 2: Analgesic requirement**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group (S) (n=26)</th>
<th>Group (B) (n=26)</th>
<th>Group (BM) (n=26)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to 1st analgesic requirement (min)</td>
<td>31.80± 7.2</td>
<td>439.8 ± 185.4*</td>
<td>756.6 ± 192†‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total diclofenac consumption(mg)</td>
<td>161±0.00</td>
<td>135.95±23.1*</td>
<td>86.5±20.71†‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total pethidine consumption(mg)</td>
<td>200±2.1</td>
<td>11.5 ± 2.3*</td>
<td>7.7± 1.8‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Number of patients received pethidine (n)(%)</td>
<td>26 (100%)</td>
<td>6 (23.07%)*</td>
<td>4 (15.38%) ‡</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data are expressed as mean± SD and numbers (%)
S: saline B: bupivacaine BM: bupivacaine morphine
P< 0.001 was considered statistically significant between the three groups.
*: statistically significant difference between group B and group S.
†: statistically significant difference between group B and group BM.
‡: statistically significant difference between group BM and group S.
ug) but was significant higher in the saline group (181±26.2 ug) (Table 4).

As regard VAS, bupivacaine group and bupivacaine morphine group showed a statistical significant lower score than the saline group during the first 6 hours, while at 12 and 24 hours there was a no statistical difference among the three groups (Table 5).

There were no significant differences in the incidence of itching, vomiting, urinary retention and respiratory depression between the three groups. However, nausea was significantly less in the bupivacaine morphine group and bupivacaine group in comparison to the saline group (3.85%, 7.69 vs. 30.77%) (P < 0.05) (Table 6).

**DISCUSSION**

Preemptive analgesia has been shown to achieve better pain control than postoperative analgesic administration (29).

Patients who undergo spinal fusion using ordinary general anesthesia usually suffer from considerable wound pain immediately after surgery (3, 15).

The most physiological pain relief methodology is to reduce discomfort, while leaving normal pain mechanisms intact without increasing risk of complications. This can be achieved by preventing pain hypersensitivity that can arise from two phases of sensory input: from tissue damage and from the inflammatory reaction to that tissue damage occurring at the surgery site in post-operative hours or days. It was shown that preemptive analgesia should eliminate both these phases of afferent input (8, 19, 32, 43, 44).

Our study showed that preemptive caudal bupivacaine morphine provided superior analgesia in terms of longer duration, better quality and reduced intra- and postoperative analgesic consumption, without occurrence

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**Table 3: Patient satisfaction score**

<table>
<thead>
<tr>
<th>Postoperative patients satisfaction score</th>
<th>Group (S) (n=26)</th>
<th>Group (B) (n=26)</th>
<th>Group (BM) (n=26)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
<td>0.0001</td>
</tr>
<tr>
<td>Excellent</td>
<td>4 (15.38)</td>
<td>17 (65.38)</td>
<td>20 (76.92)</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>7 (26.92)</td>
<td>2 (7.69)</td>
<td>4 (15.38)</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>12 (46.15)</td>
<td>3 (11.54)</td>
<td>2 (7.69)</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>3 (11.54)</td>
<td>4 (15.38)</td>
<td>0 (0.00)</td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as numbers (%).
S: saline  B: bupivacaine  BM: bupivacaine morphine.
P< 0.001 was considered statistically significant between the three groups.

**Table 4: Intraoperative blood loss, end tidal isoflurane concentration, timing to ambulate the patient and total amount of intraoperative fentanyl consumption**

<table>
<thead>
<tr>
<th>variables</th>
<th>Group (S) (n=26)</th>
<th>Group (B) (n=26)</th>
<th>Group (BM) (n=26)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperative blood loss (ml)</td>
<td>251±20</td>
<td>240±18</td>
<td>235±22</td>
<td>0.526</td>
</tr>
<tr>
<td>End tidal Isoflurane (%)</td>
<td>1.25±0.21</td>
<td>1.0±0.187*</td>
<td>0.98±0.221†</td>
<td>0.044</td>
</tr>
<tr>
<td>Timing to ambulate the patient (hr)</td>
<td>21.5±4.15</td>
<td>7.5±0.574*</td>
<td>4.8±0.32†‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total amount of intraoperative fentanyl consumption (µg)</td>
<td>181 ±26.6</td>
<td>90 ± 15.5*</td>
<td>78 ±11.3‡</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data are expressed as mean± SD
S: saline  B: bupivacaine  BM: bupivacaine morphine.
P< 0.001 was considered statistically highly significant between the three groups.
P< 0.05 was considered statistically significant between the three groups.
P >0.05 was considered statistically non-significant between the three groups.
*: statistically significant difference between group B and group S.
†: statistically significant difference between group B and group BM.
‡: statistically significant difference between group BM and group S.
of adverse effects. The time to first rescue analgesic requirement in bupivacaine morphine group was 756.6±192 min, with less total consumption of diclofenac sodium (86.5±20.71mg) in the first 24 hours as compared to bupivacaine and saline groups. This is in line with a study done by Kakuchi and Abe (22) who found that pre-incisional epidural blockade by caudal injection of 20ml 0.25% bupivacaine and 0.1 mg buprenorphine is a simple and effective way of relieving postoperative wound pain after lumbar spine operations with prolonged postoperative duration of analgesic administration and less frequency of administration of diclofenac sodium and pentazocine with less VAS, but their study was not a randomized, controlled and blinded trial and they used buprenorphine as analgesic agent which has a propensity to cause respiratory depression. Many other studies supported the finding that preemptive analgesia with caudal blocks may decrease the intensity and frequency of postoperative wound pain and provide prolonged and safe analgesia with decreased demand of rescue analgesia (18, 29, 38, 39).

Ivani et al. (20) concluded that caudal bupivacaine provides excellent analgesia in the early postoperative period, as this technique was preferable from the practical point of view for lumbosacral spinal surgeries done through the posterior approach. The patient is already placed in the knee chest position after general anesthesia.

Table 5: VAS scoring

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group(S) (n=26)</th>
<th>Group(B) (n=26)</th>
<th>Group(BM) (n=26)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (hr)</td>
<td>6.7±0.99</td>
<td>3.2±0.55*‡</td>
<td>3.0±0.34‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1 (hr)</td>
<td>3.7±0.98</td>
<td>1.33±0.50*‡</td>
<td>1.20±0.32‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2 (hr)</td>
<td>3.64±0.92</td>
<td>1.56±0.82*‡</td>
<td>1.59±0.56‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>4 (hr)</td>
<td>4.43±0.89</td>
<td>1.98±0.78*‡</td>
<td>1.67±0.61‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>6 (hr)</td>
<td>3.80±0.84</td>
<td>2.24±0.79*‡</td>
<td>1.97±0.76‡</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>12 (hr)</td>
<td>4.00±0.79</td>
<td>3.96±0.67</td>
<td>3.82±0.68</td>
<td>0.597</td>
</tr>
<tr>
<td>24 (hr)</td>
<td>4.55±0.79</td>
<td>4.87±0.59</td>
<td>4.23±0.74</td>
<td>0.114</td>
</tr>
</tbody>
</table>

Data are expressed as mean SD.

S: saline; B: bupivacaine; BM: bupivacaine morphine

P<0.001 was statistically significant between the three groups.

P>0.05 was considered statistically non-significant between the three groups.

*: statistically significant difference between group B and group S.

‡: statistically significant difference between group BM and group S.

Table 6: Side effects

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group (S) (n=26)</th>
<th>Group (B) (n=26)</th>
<th>Group (BM) (n=26)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
</tr>
<tr>
<td>Itching</td>
<td>1 (3.85)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0.363</td>
</tr>
<tr>
<td>Nausea</td>
<td>8 (30.77)</td>
<td>2 (7.69)*</td>
<td>1 (3.85)‡</td>
<td>0.0106</td>
</tr>
<tr>
<td>Vomiting</td>
<td>2 (7.69)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0.128</td>
</tr>
<tr>
<td>Urinary retention</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>1 (3.85)</td>
<td>0.363</td>
</tr>
<tr>
<td>Respiratory depression</td>
<td>2 (7.69)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0.128</td>
</tr>
</tbody>
</table>

Data were expressed as numbers (%). Fisher's exact test was used.

S: saline; B: bupivacaine; BM: bupivacaine morphine.

P<0.001 was statistically significant between the three groups.

P>0.05 was considered statistically non-significant between the three groups.

*: statistically significant difference between group B and group S.

‡: statistically significant difference between group BM and group S.
which is ideal for palpation and identification for of caudal space thus reducing the time needed to achieve the same results and the site of injection is away from the site of surgery thus decreasing the risk of infection if the dura is opened (12,22,30,39).

We use the combination of 30 ml 0.25% bupivacaine with addition of 2 mg morphine as epidural opioids are long acting and block dull pain from inflammation but have a slow onset and do not abolish the sharp pain from incision (10) and bupivacaine provides analgesia for several hours and morphine for rather longer so they block the operative pain and pain from early inflammatory reaction. This may thus reduce the total amount of non-steroidal anti-inflammatory drugs (NSAIDs) consumption postoperatively as recently many studies have reported the effect of NSAIDs on spinal fusion, that is the increasing rate of pseudoarthrodesis (16,36). Also many authors proposed that addition of opioid as an adjuvant may bind better to spinal opioid receptors (31, 34, 40) and have a synergistic effect, and/or preemptive effect of the drug mixture but with potential of the serious risk of respiratory depression (38). Therefore minimizing the dose of morphine to provide analgesia without opioid side effects is an important goal.

It was found too that bupivacaine 0.25% prevents the dense blockade that may interfere with the appropriate evaluation of leg motion immediately after surgery because of the pharmacokinetic duration of 0.5% bupivacaine (21). Caudal injection of 30 ml of the anesthetic solution over one minute induces analgesia up to the upper lumbar or lower thoracic level with non-significant side effects compared to Park et al. (33) who injected 20 ml of the anesthetic solution.

In our study, there was a statistically significant difference between the three groups as regard the VAS during the first 6 hours due to the effect of both bupivacaine and morphine and this coincides with the study of Badner et al. (6) who studied the effect of adding low dose bupivacaine to epidural fentanyl in orthopedic patients and differs from Cosar et al. (9) who compared the effect of adding epidural morphine to low dose bupivacaine on postoperative pain following lumbar laminectomy or discectomy.

As regards the hemodynamics, our study showed a statistically non-significant decrease of blood pressure and heart rate among the three groups. This may be due to vasodilatation resulting from de-sympathetic effect of epidural blockade in the bupivacaine and morphine bupivacaine group and the increase of total consumption of intraoperative fentanyl in the saline group which was a direct effect of increased intraoperative analgesic requirement in this group. Also intraoperative blood loss amount was similar in all groups and this may be due to similarity of the mean blood pressure values in all groups; these findings coincide with many studies (21, 38, 47).

Our study demonstrated too that intraoperative isoflurane consumption and fentanyl need were significantly less in the bupivacaine morphine group than that in the bupivacaine group which in turn was better than that in the saline group; this may be due the caudal effect of morphine and bupivacaine.

As regards the timing of ambulation, patients in the morphine bupivacaine group revealed significantly earlier ambulation than those in the bupivacaine group who already showed earlier ambulation time than the saline group. We think this is due to proper analgesia in this group due to the effect of caudal analgesia that made getting the patient out of bed easier. Also these groups required less pethidine than the saline group and thus the degree of alertness needed for ambulation was maintained making ambulation easily achievable.

Our study revealed rare occurrence of side effects as regards vomiting and urinary retention in the morphine bupivacaine and the bupivacaine groups. This may be due to the fact that the postoperative narcotic consumption was significantly higher in the saline group. This comes in line with other studies by Ferrante et al. (14) that compared patient controlled analgesia with conventional intramuscular opioids. Sekar et al. (39) noted the development of transient post-operative urinary retention after injection of a single caudal bupivacaine and tramadol, while Kundra et al. (29) recorded minimal narcotic-induced adverse effects in preemptive epidural morphine 60 minute before the surgery followed by epidural placebo at the end of the surgery compared to the control group that received epidural placebo preoperatively followed by 3 mg epidural morphine at the conclusion of the surgery.

On the contrary, Dahl et al. (11) were unable to demonstrate any benefits from administering preemptive analgesia with continuous extradural bupivacaine and
morphine to a group of adult patients undergoing colonic surgery as it is an extensive and prolonged major surgery with a low concentration of the studied drugs.

Rice et al.(35) also did not advocate preemptive analgesia in patients undergoing hernia repair because of inadequate volume of bupivacaine used for causal anesthesia, the same as other authors who used insufficient concentration of bupivacaine (0.1%) in knee surgery and low dose of 2 ml bupivacaine 0.5% in lumbar laminectomy (6,9).

In conclusion, pre-emptive caudal morphine bupivacaine in single level lumbar decompression and instrumented posterolateral intertransverse fusion surgery provides prolonged postoperative duration of analgesia with less NSAIDs and pethidine analgesic requirements both intra- and postoperatively with earlier patient ambulation without occurrence of any hemodynamic changes or increased incidence of adverse effects.

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