COMPARISON BETWEEN CAUDAL BUPIVACAINE PLUS KETAMINE AND BUPIVACAINE PLUS TRAMADOL FOR POST-OPERATIVE PAIN RELIEF IN LUMBAR SPINE SURGERIES

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ABSTRACT

BACKGROUND

Various drugs have been used as adjuvants to caudal bupivacaine for postoperative analgesia, but most were in children and with variable results.

MATERIALS AND METHODS

Present study was conducted on 60 adult patients of ASA Grade 1, 2 and 3 of either sex, aged between 18 and 70 years and were randomly allocated into one of the two groups in a double-blind manner. Group BK received 30 mL of 0.166% Bupivacaine and 0.5 mg/kg of preservative free ketamine and Group BT received 30 mL of 0.166% Bupivacaine and 2 mg/kg of preservative free Tramadol, caudally after general anaesthesia was administered and patient turned prone. The duration of analgesia, the total analgesic requirement for the first 24 hours and side effects if any were noted and analysed statistically.

RESULTS

Mean duration of analgesia in Group BK was 576 ± 392 min and Group BT was 630 ± 398 min, which was not statistically significant. The mean requirement of morphine post-operatively in Group BK was 7.7 ± 5.3 mg and that in BT was 9.5 ± 8.3 mg respectively. The difference was not statistically significant. There was no increased incidence of side effects like nausea, vomiting or itching in either of the two groups.

CONCLUSION

Ketamine and Tramadol may be regarded as useful adjuncts to bupivacaine for providing analgesia in lumbar spine surgeries with no significant side effects.

KEYWORDS

Caudal, Post-Operative Pain Relief, Ketamine, Tramadol.

HOW TO CITE THIS ARTICLE: Santha R, George G. Comparison between caudal bupivacaine plus ketamine and bupivacaine plus tramadol for post-operative pain relief in lumbar spine surgeries. J. Evolution Med. Dent. Sci. 2017;6(1):33-35, DOI: 10.14260/Jemds/2017/10

BACKGROUND

Surgery on lumbar spine is known to cause severe pain in the post-operative period. Intrathecal¹ and epidural narcotics² have been widely used to relieve pain and provide post-operative analgesia. Bupivacaine in combination with ketamine³ has been proved to prolong the duration of analgesia. Tramadol is a racemic mixture of 2 enantiomers, (+) exhibiting serotonin uptake and (-) with norepinephrine inhibitor. These complimentary properties result in a synergistic anti-nociceptive interaction between the two enantiomers.⁴ The result is an opioid with lack of respiratory depressant effects despite an analgesic potency shown to be equal to pethidine in some studies.^{5,6,7} Tramadol has shown to provide effective, long lasting analgesia after extradural administration in children.^{8,9,10}

But both these drugs have not been compared when given as caudal injection in adult lumbar spine surgery patients. In an attempt to provide pain relief in the immediate post-operative period and thereby smoother emergence from anaesthesia, we decided to use pre-incisional caudal injection of low concentration of bupivacaine in combination with either Tramadol or Ketamine and to compare the effects of both.

MATERIALS AND METHODS

After obtaining approval of the Hospital Ethics Committee and written informed consent, 60 ASA Grade 1, 2 and 3 patients under the age of 70 years undergoing both elective and emergency lumbar spine surgeries under general anaesthesia were included in this prospective double-blind randomised clinically controlled study. Patients with poor comprehension, infection at the site of injection, obesity, extremely small patients (weight less than 30 kg) and those with spinal deformity were excluded from the study. The patients were grouped into two, Group BK (n = 30) received 30 mL of 0.166% Bupivacaine and 0.5 mg/kg of preservative free ketamine and Group BT (n = 30) received 30 mL of 0.166% Bupivacaine and 2 mg/kg of preservative free Tramadol. Patients were visited preoperatively and were familiarised with the assessment of pain after surgery. A written informed consent was obtained.

Financial or Other, Competing Interest: None.

Submission 28-11-2016, Peer Review 22-12-2016,

Acceptance 28-12-2016, Published 02-01-2017.

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DOI: 10.14260/Jemds/2017/10

After adequate fasting and anxiolytics and antacid premedication, patients were shifted to operating room. After establishing IV access and attaching monitors, general anaesthesia was induced with 4 - 5 mg/kg of thiopental sodium combined with 0.2 mg glycopyrrolate, 0.1 mg/kg of morphine was given as analgesia. Endotracheal intubation was done 3 min after administration of 0.1 mg/kg of pancuronium bromide. Anaesthesia was maintained with O₂, N₂O and isoflurane. Supplementary doses of morphine was given intraoperatively if needed up to a total dose of 0.15 mg/kg.

After positioning the patient prone for surgery, caudal injection was given with 23-G 1 1/2 inch disposable sterile needle. The time of injection was noted as 0 time. ECG, blood pressure and oxygen saturation were monitored continuously and recorded every 5 min during the initial 30 min and then every 30 min till 180 min after caudal injection. At the end of surgery, all the patients were extubated when awake, at which time they were assessed for pain using Visual Analogue Scale (VAS).^{11,12,13} Sedation was assessed using the sedation score.¹⁴ The duration of analgesia was noted as the time since the caudal injection was given, till the first dose of rescue analgesic after surgery. The total analgesic requirement for the first 24 hours, side effects like nausea, vomiting, hallucinations, itching and burning sensation in the lower limbs and others if any were noted.

RESULTS

Both the groups were similar in constitution with regards to age, sex and general characteristics of patients and duration of surgery and anaesthesia. There was a statistically significant difference in mean weight of the patients (p value 0.009). But this is not clinically significant and does not interfere with assessments since the drugs were administered per kg body weight (Table 1). Morphine requirements were statistically similar in both groups. Cardiovascular changes were similar with a gradual decline in blood pressure in both groups after caudal injection, which was a beneficial effect in spine surgeries. No patient had significant systemic hypotension requiring therapeutic intervention. Pain assessment after extubation revealed VAS score above 69. (Zone of analgesic failure) in 3 patients each in both groups. Majority were in the zone of analgesic success (0 - 30).

The mean requirement of morphine post-operatively and the mean duration of analgesia were similar in both the groups.

There was no increased incidence of nausea, vomiting and itching in either of the two groups. Two patients in Group BK complained of transient leg cramps, which subsided without treatment.

The analysis of the study was done using 't' test and chi square test.

	Group BK	Group BT	P value
Age (yrs.)	Mean 42.23±12.88	Mean 42.26±10.96	0.991
Weight (kg)	58.43±9.9	64.48±7.28	0.009
Male: Female	15:15	19:11	
Duration of Surgery (min)	123.33±44.3	125.03±55.81	0.896

Duration of anaesthesia (min)	168.13±48.74	179.23±61.96	0.444
Caudal injection to incision time (min)	12.7±6.24	11.1±4.31	0.253

Table 1. Showing Demographic Data and Duration of Surgery and anaesthesia among Various Groups

DISCUSSION

Providing intraoperative pain relief is mandatory during the administration of any anaesthesia. It will be excellent if it would be extended into the post-operative period as well. The prevention of pain is much simpler to achieve than the treatment of pain once established. Source of pain after spinal surgery include the skin incision, healing muscle tissue with reactive spasm, dural and nerve root inflammation, the site of bone excision at the vertebra and the graft donor site and internal fixation devices reacting with overlying tissues. Regional analgesic techniques are the presently favoured methods for supplementing analgesia intra- and post-operatively, as they do not produce over sedation or respiratory depression. Bupivacaine has been proven to be effective in providing epidural and caudal analgesia in varying concentrations. Tramadol and ketamine are becoming increasingly popular as adjuncts to bupivacaine in prolonging the duration of analgesia. But interestingly studies comparing the analgesic efficacy of both these drugs used as adjuncts in caudal is lacking. Hence, we undertook this study to compare the efficacy of both the drugs when administered caudally in lumbar spine surgeries.

In our present study, the mean duration of analgesia in Group BK was 576 ± 392 min and in Group BT was 630 ± 398.96 min (p = 0.596) (Table 2).

	Group BK	Group BT	P value
Duration of Analgesia (min)	576 ± 392	630 ± 398	0.596
Post-operative 24 hrs. morphine requirement (mg)	7.7 ± 5.3	9.5 ± 8.3	0.322

Table 2

Looking at the duration of analgesia in blocks of 4 hours, only 5 patients demanded rescue analgesia in both groups in the initial 4 hours. These patients had the extended effect of intraoperative analgesia and hence any difference in duration of analgesia between the two groups will not be revealed during this period.

In the 4.0 to 8.0 hours, 12 patients in BK Group as compared to 8 in BT Group demanded rescue analgesia, but in the next 4 hours it was 4 and 7 respectively.

None of these differences were statistically significant (p value 0.513). At the end of 12 hours, 1/3rd of patients in both the groups had analgesia more than 12 hours and did not request for rescue analgesic, which could be attributed to caudal analgesia alone. Of those patients, 2 in Group BK and 3 in Group BT did not receive any rescue analgesics at all in the first 24 hours.

Sedation score was comparable in both the groups. All patients were ambulated by 3rd or 4th post-operative day.

There was no increased incidence of side effects like nausea, vomiting or itching in both the groups. None of the patients in Group BK had hallucinations (Table 3).

Side Effects	Group BK	Group BT	P value
Nausea	2	5	0.228
Vomiting	3	1	0.301
Itching	2	0	0.15
Burning sensation	0	0	
Hallucinations	0	0	
Other leg cramps	2	0	0.15

Table 3

Urinary retention is a known complication of caudal analgesia. But all patients were routinely catheterised and on removal of catheter on 3rd post-operative day, none of them had urinary retention.

CONCLUSION

We would like to Highlight the following Aspects -

1. Since all the patients were operated in the prone position, access to the epidural space through the sacral hiatus is easier for providing caudal analgesia for spine surgeries.
2. Though statistically not significant, the tramadol group appears to be more advantageous clinically, especially in controlling the initial postoperative pain because of the prolonged total duration of analgesia of about an hour and the lesser requirement of rescue analgesic in the 4 to 8 hours after surgery, during which period the analgesia can be attributed to caudal alone.
3. There were no CNS side effects like hallucinations as expected with ketamine or any intractable nausea or vomiting as expected with Tramadol. Epidural opioids which are the other commonly used additives have the risk of respiratory depression, which could be avoided with these substitutes.
4. Both ketamine and tramadol are comparable with respect to cost and availability.

Thus, to conclude, both ketamine and tramadol can be regarded as useful adjunctive agents to bupivacaine for providing analgesia in lumbar spine surgeries, but given a choice tramadol may be clinically more advantageous with regards to prolonged analgesia as well as in controlling the initial postoperative pain and hence may be preferred over ketamine. This technique of caudal analgesia can be made useful in surgeries involving lower extremities, especially in patients where lumbar epidural access is technically difficult.

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