ORIGINAL RESEARCH

Comparative study of ketamine and fentanyl with bupivacaine in spinal anaesthesia in patients undergoing total abdominal hysterectomy

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ABSTRACT

Background: Spinal anaesthesia is preferred technique for conducting abdominal hysterectomy, but it is insufficient to provide post-operative analgesia adequately. The addition of local anaesthetic adjuvants increases subarachnoid block efficacy and prolongs postoperative analgesia. Due to its fast onset with a limited time of action with minimal cephalic spread, Fentanyl is preferred as an adjuvant in spinal anaesthesia. Adding Fentanyl to a low dose, Bupivacaine offers improved surgical anaesthesia and increased block reliability. Ketamine has several clinically useful properties, including analgesia and less cardiorespiratory depressant effects than other anaesthetic agents, in fact it causes some stimulation of the cardiovascular system.

Objectives: To compare the Duration of the postoperative analgesia (Time of 1st rescue Analgesic) between intrathecal administration of Ketamine and fentanyl with bupivacaine. To compare the duration and onset of sensory and motor block (modified bromage scale), the effect on hemodynamic parameter, Degree of sedation and side – effects (post-operative nausea and vomiting, pruritus, shivering, urinary retention and any other).

Methodology: Two group were included in this study i.e. Group A & Group B. Both group had 18 cases for total abdominal hysterectomy Group A(n=10)- received 15mg of Bupivacaine 0.5% along with Fentanyl 25 mcg intrathecally and Group B (n=10)- received 15mg of Bupivacaine 0.5% along with Ketamine 25 mgintrathecally. The onset of sensory and motor block, duration of block, hemodynamic parameter, sedation score, total postoperative analgesia time, and side effects if any will be recorded.

Results: Demographic variables were compared between both groups A and B. Group A is A significant faster onset of sensory block was found in ketamine group in comparison to fentanyl group. (p-value<0.001). While the time to achieve the highest level of sensory block was found to be almost similar in both the groups.

Conclusion: ketamine or fentanyl to spinal bupivacaine were equally effective in pain control after abdominal hysterectomy.

Keywords: Hysterectomy, Bupivacaine, Fentanyl, Ketamine

INTRODUCTION

Spinal anaesthesia is the preferred technique for most of the lower abdominal surgeries. It is more advantageous than general anaesthesia i.e., minimum haemodynamic disturbances with minimum stress response, optimal operative conditions and less chance of post-operative morbidity [1]. Hyperbaric bupivacaine 0.5% is widely used in spinal anaesthesia. The main disadvantage of spinal anaesthesia with bupivacaine 0.5% is that it won't prolong the duration of post-operative analgesia [2]. Along with this, several intrathecal adjuncts are also used to enhance spinal anaesthesia. A localised anaesthetic and an opioid combination can offer greater analgesia during the perioperative and postoperative periods. Nowadays, opioids are commonly used for pain relief. They often provide suboptimal analgesia with occasional serious side effects. The most frequently used intrathecal lipophilic opioid is fentanyl. It is used as an analgesic adjuvant with minimal cephaladspread-making. It is the most safer among all the intrathecal opioids to cause delayed respiratory depression. [1] In the postoperative period, neuraxial opioids provide prolonged analgesia and faster recovery from spinal anaesthesia.[2]. A potent synthetic opioid that is comparable to morphine but generates more analgesia is called fentanyl. This potent pharmacologic substance is often 50–100 times more powerful. Analgesia comparable to around 10 mg of morphine can be achieved with a single dose of 100 micrograms of the drug.[3,4] On the other hand, fentanyl has highly distinct pharmacokinetics and characteristics. Its most frequent clinical uses are as a sedative in mechanically ventilated patients and as a severe pain reliever in patients with renal failure due to its predominantly hepatic clearance. Patients with persistent pain who have grown tolerant to opiates may also be treated with fentanyl by medical professionals.[5] Ketamine is an anesthetic agent which also has effective analgesic properties. It is effective by epidural and intrathecal routes of administration. Ketamine acts by causing noncompetitive antagonism at N methyl D aspartate (NMDA) receptors and it also has local anaesthetic effects as well. [6]The present study was conducted to compare the effects of intrathecal fentanyl 25μg added to 0.5% hyperbaric bupivacaine and intrathecal ketamine 25 mg added to 0.5 % hyperbaric bupivacaine. In the present study, the effects of both agents on sensory and motor blockade, duration of analgesia as a primary outcome variable, hemodynamic variations, and adverse effects were compared.

MATERIAL AND METHODS

This was a Comparative study was conducted on 20 patients aged between 20 and 50 years of age. 20 patients scheduled for abdominal hysterectomy were randomized into 2 groups in which Group A(n=10)- received 15mg of Bupivacaine 0.5% along with Fentanyl 25 mcg intrathecally and Group B (n=10)-received 15mg of Bupivacaine 0.5% along with Ketamine 25 mg. They were monitored with automated noninvasive blood pressure, pulse oximetry, and electrocardiogram. 25G Pencil point spinal needles were introduced through L3–L4 interspaces in sitting position using aseptic precautions. Intrathecal injection was given over approximately 10–15 s. Immediately after completion of the injection patients were made to lie supine.immediately after block performance HR, SBP, DBP and SpO2 were noted at baseline, and then every 2 min for the first 10 min and then at 15, 25, 40 and 60 min, followed by every 30 min till the end of the surgery.Hypotension, defined as a decrease of systolic blood pressure by more than 30% from baseline or a fall below 90 mmHg, was treated with incremental IV doses of ephedrine 5 mg and IV fluid as required. Bradycardia, defined as heart rate < 50 bpm, was treated with IV atropine 0.3–0.6 mg. The incidence of adverse effects, such as nausea, vomiting, shivering, pruritus, respiratory depression, sedation, and hypotension were recorded.

On achieving T7 sensory blockade level, surgery was allowed. Testing was then conducted every 10 min until the point of two segment regression of the block was observed. Time of

onset of sensory blockade was taken as the time to attain the highest level of sensory blockade. Two segment regression time was defined as time of regression of sensory level by two segments from the highest level attained. The duration of sensory block was defined as the time from intrathecal injection to regression of the sensory block to L1. Whereas duration of analgesia was defined as the time from spinal injection to the time of administration of first rescue analgesic for pain in the postoperative period.Diclofenac was given intramuscularly as rescue analgesia when VAS was >4.

Continuous covariates were compared using analysis of variance (ANOVA). The comparison was studied using the Chi-square test or Fisher's exact test as appropriate, with the P value reported at the 95% confidence interval. $P<0.05$ was considered statistically significant.

RESULTS

All the patients data was collected. The demographic variables were compared in both the group A and B. age distribution in compared and mentioned in Table 1.The onset of sensory and motor block is faster in ketamine group B when compared with Fentanyl group A mentioned in Table 2

Table 1: Age distribution in both groups

Age	Group A	Percentage	Group B	Percentage
20-30	5	25	5	25
30-40	9	45	8	40
40-50	6	30	7	35
Total	20	100	20	100

Table 2: Onset and Duration of sensory and motor blockade in Group A and Group B

Variable	Group A	Group B	P value
Onset on sensory block	2.12±0.44	2.83±0.44	<0.001
Onset on motor block	1.23±0.44	1.81±0.46	<0.001
Duration of sensory block	87.78±5.91	96.97±8.20	<0.001
Duration of motor block	121.76±6.61	130.33±10.8	<0.001
Total Duration	152.65±8.10	158.42±11.19	<0.001

A highly significant early regression to L1 dermatome was noticed in ketamine group in comparison to fentanyl group (88.58±5.91 min and 96.97±8.20min respectively). Similarly, in the ketamine group, onset of motor block was reported to be faster significantly (p-value<0.001) in comparison to fentanyl group. (1.24±0.44 min and 1.81±0.46 min respectively). On other hand, the duration of motor block and duration of analgesia were significantly longer in fentanyl group in comparison to ketamine group. While, the degree of motor block was comparable in both of the groups as Bromage core[3] was reported in all the patients as mentioned in Table 2. In the study of pre- and postoperative adverse effects like hypotension, bradycardia, shivering and nausea, no significant differences were reported between both the groups mentioned in Table 3.

Table 3: Adverse Effect observed in Group A and Group B

Adverse Effect	Group A	Group B
Hypotension	6	7
Bradycardia	4	5
Nausea and vomiting	3	3
Shivering	2	2

DISCUSSION

In the present study, the faster onset of sensory as well as motor blockade was noticed while the duration of spinal analgesia was not prolonged when intrathecal hyperbaric bupivacaine was added to preservative free ketamine in comparison to addition of fentanyl to intrathecal hyperbaric bupivacaine in patients scheduled for abdominal hysterectomy under spinal anaesthesia.[7,8]

Yekdaset.al in study reported that Fentanyl has longer time to fast pain than Midazolam and the most common side effect seen in Fentanyl group is pruritus, tremor, urinary retention and post-spinal headache. But in case of Midazolam, hypotension is significantly higher than the other groups [9]. So it may be suggested that intrathecal Midazolam can be used as an adjuvant in case of pregnancy induced hypertensive patient undergoing an elective caesarean section [10,11].

In comparison to ketamine group, fentanyl group was found to be longer induration of sensory-motor block and postoperative analgesia. The similar observations were showed in studies done by Unlugenc, Shrestha and Kathirvel et al.Routray et al. suggested that Fentanyl in addition to Bupivacaine in spinal anaesthesia may be a suitable choice when sedation is not desirable [12-14]. Research reports also indicated that Fentanyl and Midazolam improves the duration and onset of motor and sensory block with relatively haemodynamic stability, increases duration of analgesia and decreases consumption of systemic analgesics in comparison to Bupivacaine alone [15]. However, the discrepancy of the results may be due to different methodologies. Hypotension endured the most commonly observed adverse effect. Though, it was controllable with fluid bolus or with inj atropine. The incidence of hypotension were observed more in fentanyl group.

CONCLUSION

This study shows that's faster action in sensory and motor blockade were observed by adding adjuvants ketamine and fentanyl with bupivacaine. While the impact on duration of action were not show differences compared to addition of fentanyl 25 µg to 10 mg of hyperbaric bupivacaine 0.5% undergoing abdominal hysterectomy with spinal anaesthesia. On the other hand, fentanyl provides prolonged duration of analgesia. Therefore, it can be concluded that the adjuvants fentanyl and ketamine were equally effective with the bupivacaine.

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