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Dexmedetomidine as an adjuvant for 0.5% Bupivacaine in subarachnoid block for Urological Surgeries.

KEYWORDS: Subarachnoid block, Bupivacaine, Dexmedetomidine.

Dr. Inturi Ravi Mohan., M.D.,D.A
Professor, Department of Anesthesiology
Alluri sitarama Raju Academy Of Medical Sciences
Eluru-534005, West Godavari, A.P.

Dr. Y. Sudheer Kumar
Post graduate, Department of Anesthesiology,
Alluri sitarama Raju Academy Of Medical Sciences,
Eluru-534005, West Godavari, A.P.

ABSTRACT ***AIM AND OBJECTIVE:*** *Comparative study of 0.5% bupivacaine with dexmedetomidine and 0.5% bupivacaine in subarachnoid block in urological surgeries for perioperative analgesia*

- *Onset and duration of adequate analgesia*
- *Onset and duration of motor and sensory block*
- *Adverse effects, if any*

METHODOLOGY: *60 patients undergoing lower abdominal urological procedures were randomly allocated to 2 groups of 30 each.*
Group A *30 patients received 12.5 mg of hyperbaric 0.5% bupivacaine plus 0.5ml normal saline in Sub arachnoid block.*
Group B *30 patients received 12.5mg of hyperbaric 0.5%bupivacaine with 5 microgram of Dexmedetomidine in Sub arachnoid block.*
Results: *The duration of analgesia, time to reach T10 level block (p=0.006), duration of motor blockade (p=0.0) were prolonged in group B which was statistically significant.*
Conclusion: *Intrathecal addition of dexmedetomidine to bupivacaine is associated with prolonged motor blockade,prolonged sensory blockade,more hemodynamic stability, reduced demand for rescue analgesics in 24 hrs compared to Bupivacaine alone for sub arachnoid block.*

INTRODUCTION:
Addition of Dexmedetomidine, a new highly selective α2-agonist, is under evaluation as a neuraxial adjuvant as it provides stable hemodynamic condition, good quality of intraoperative and prolonged postoperative analgesia with minimal side effects. Based on earlier human studies, it is hypothesized that intrathecal 5 μg dexmedetomidine would produce more postoperative analgesic effect with hyperbaric bupivacaine in spinal anaesthesia with minimal side effects.

METHOD:
After obtaining institutional ethical committee clearance, the study was undertaken in 60 patients aged 18-75 years old of either gender, belonging to American Society of Anaesthesiologist (ASA) class I ,II and III and scheduled for lower abdominal urological surgeries under subarachnoid block. The 60 patients in the study were randomly allocated into two groups of 30 each. A thorough pre-anaesthetic evaluation was performed. On the day of surgery, a 18-guage intravenous line was secured, routine monitors were attached, group A 30 patients received 12.5 mg of hyperbaric 0.5% bupivacaine plus 0.5ml normal saline in Sub arachnoid block and group B 30 patients received 12.5mg of hyperbaric 0.5%bupivacaine with 5 microgram of Dexmedetomidine in Sub arachnoid block. Parameters observed were Heart rate, blood pressure and respiratory rate were recorded every 10 minutes intraoperatively till the end of surgery.

Sensory block was assessed by cold alcohol swab along the mid clavicular line bilaterally. Motor block was assessed by modified Bromage scale. Time to reach T10 sensory block, peak sensory block level and Bromage grade3 motor block were recorded before start of surgery. The time taken for regression of sensory and motor block were recorded in Post operative care unit. Probability (P) value of ≤ 0.05 was considered to be significant.

RESULTS:
The demographic data with respect to age ,sex, weight, ASA grading were statistically not significant.

Intraoperative hemodynamic parameters like HR, SBP, DBP, RR ,SPO2 and VAS were measured and were not significant statistically.

TABLE 1:

	Bupivacaine	Bupivacaine +Dexmed	t- test	Probability
30min	0.000	0.033	1.000	0.321
60 min	0.100	0.233	1.240	0.220
120min	0.867	0.467	2.273	0.027
240min	1.900	1.033	3.489	0.001
360min	2.167	1.300	3.672	0.001
mu Drug	1.007	0.613		

P value for pain score at 30min, 60 min, 120min, 240min, 360 min respectively were 0.321, 0.220, 0.027,0.01, 0.01 which is a significant value. That is group B patients had prolonged duration of analgesia.

The maximum duration of sensory block in Group A was 220min and in Group B was 380 min. The maximum duration of motor block in Group A was 200min and in Group B was also 353 min. The p valve for peak sensory block between groups was 0.757 which was of no significance.

TABLE 2: Analysis of Variation for TIME TO T10 :

Source of variation	Df	Sum of Square	Mean of Square	F Ratio	Probability
BetweenGroups	1	11.094	11.094	8.153	0.006
With in groups	58	78.924	1.361	0.000	0.000
Total	59	90.018	1.526		

P value for time to reach T10 level block was 0.006 which is significant.

TABLE 3: Analysis of variation for TIME TO Bromage grade 3:

Source of variation	Df	Sum of Square	Mean of Square	F Ratio	Probability
BetweenGroups	1	0.259	0.259	0.191	0.664
With in groups	58	78.726	1.357	0.000	0.000
Total	59	78.985	1.339		

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Time to reach Bromage 3 showed insignificant p value (0.664)

TABLE 4: Analysis of variation for REGRESSION TIME TO BROMAGE grade 0:

Source of variation	Df	Sum of Square	Mean of Square	F Ratio	Probability
BetweenGroups	1	294560.281	294560.281	544.792	0.000
With in groups	58	31359.666	540.684	0.000	0.000
Total	59	325919.938	5524.067		

Time to reach Bromage 0 showed very significant p value (0.0) that is group B had longer duration of motor blockade.

Adverse effects like nausea, vomiting, hypotension, bradycardia were not significant statistically.

DISCUSSION:

The mechanism by which intrathecal 2-adrenoceptor agonists prolong the motor and sensory block of local anesthetics is not well known. They act by binding to presynaptic C-fibers and postsynaptic dorsal horn neurons. Their analgesic action is a result of depression of the release of C-fiber transmitters and hyperpolarisation of postsynaptic dorsal horn neurons. Local anesthetic agents act by blocking sodium channels. The prolongation of effect may result from synergism between local anesthetic and α2-adrenoceptor agonist, while the prolongation of the motor block of spinal anesthetics may result from the binding of α2-adrenoceptor agonists to motor neurons in the dorsal horn. Intrathecal α2-receptor agonists have been found to have antinociceptive action for both somatic and visceral pain.

In our study, the intrathecal dose of dexmedetomidine selected was based on previous animal studies. A number of animal studies conducted using intrathecal dexmedetomidine at a dose range of 2.5–100 μg did not report any neurologic deficits with its use. Fukushima *et al* administered 2 μg/kg epidural dexmedetomidine for postoperative analgesia in humans but did not report neurologic deficits.

Our study has shown that the addition of 5 μg dexmedetomidine with hyperbaric bupivacaine significantly prolongs both sensory and motor block. Dexmedetomidine provided good quality intraoperative analgesia and hemodynamic stability. The analgesia was clinically better in group B as compared to group A but it was not statistically significant.

Small doses of intrathecal dexmedetomidine (3μg) used in combination with bupivacaine in humans have been shown to shorten the onset of motor block and prolong the duration of motor and sensory block with hemodynamic stability and lack of sedation. Al-Ghanem *et al* had studied the effect of addition of 5 μg dexmedetomidine or 25 μg fentanyl intrathecal to 10 mg isobaric bupivacaine in vaginal hysterectomy and concluded that 5 μg dexmedetomidine produces more prolonged motor and sensory block as compared with 25 μg plain bupivacaine. In our study, in the dexmedetomidine group we found longer duration of both sensory and motor blockade, stable hemodynamic condition, and good patient satisfaction. Al-Mustafa *et al* studied effect of dexmedetomidine 5 and 10 μg with bupivacaine in urological procedures and found that dexmedetomidine prolongs the duration of spinal anesthesia in a dose-dependent manner. Visceral pain usually occurs during abdominal surgery under spinal anesthesia. Plain bupivacaine when added to local anesthetics reduces visceral and somatic pain. In our study as no patient perceived visceral pain in both bupivacaine and dexmedetomidine groups.

In our study hypotension was more in the dexmedetomidine group than in the bupivacaine group, but it was not statistically significant. A 4-week follow-up showed that intrathecal dexmedetomidine, at a dose of 5 μg, was not associated with any new onset of back, buttock, or leg pain, weakness or neurologic deficit. The α-2 adrenergic agents also have antishivering property as observed by Talke et al. We too did not find any incidence of shivering in the two groups.

In conclusion, 5 μg dexmedetomidine seems to be an attractive alternative as an adjuvant to spinal bupivacaine in surgical procedures. It provides good quality of intraoperative analgesia, hemodynamically stable conditions, minimal side effects, and excellent quality of postoperative analgesia.

CONCLUSION

Intrathecal dexmedetomidine is associated with
1. Prolonged motor blockade
2. Prolonged sensory blockade
3. More hemodynamic stability
4. Reduced demand for rescue analgesics in 24 hrs compared to Bupicacaine alone sub arachniod block.

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