EFFECT OF ADDING DEXMEDETOMIDINE VERSUS FENTANYL TO INTRATHECAL BUPIVACAINE ON SPINAL BLOCK CHARACTERISTICS IN GYNAECOLOGICAL PROCEDURES- A COHORT STUDY

Dhanya R[1], Nikhil Nandan[2], Linnette J. Morris[3]

[1]Additional Professor, Department of Anaesthesia, Government Medical College, Thiruvananthapuram, Kerala, India.
[2]Senior Resident, Department of Anaesthesia, Government Medical College, Thiruvananthapuram, Kerala, India.
[3]Professor and Head, Department of Anaesthesia, Government Medical College, Thiruvananthapuram, Kerala, India.

ABSTRACT

BACKGROUND

Various adjuvants have been used along with local anaesthetics to prolong analgesia and to avoid intraoperative pain. Dexmedetomidine, a new highly selective α-2 agonist drug is now being used as a neuraxial adjuvant. The aim of the study was to compare the duration of analgesia and haemodynamic effects of dexmedetomidine or fentanyl given intrathecally with 0.5% hyperbaric bupivacaine.

MATERIALS AND METHODS

60 patients classified in ASA class I and II scheduled for gynaecological procedures was studied and they were given 15 mg of hyperbaric bupivacaine (3 cc, 0.5%) plus 5 μg dexmedetomidine (in 0.5 mL sterile water Group A) or 15 mg hyperbaric bupivacaine (3 cc, 0.5%) plus 25 μg fentanyl (0.5 mL sterile water) Group B intrathecally.

RESULTS

The result of our study showed that patients in group A had significantly longer duration of analgesia compared to fentanyl group B. The mean duration of analgesia were 375.5 ± 9.19 min. and 256.87 ± 9.72 mins. (P<0.001). The haemodynamic profile was significantly better in fentanyl group B than in dexmedetomidine group A in the first 20-30 mins. after giving the block.

CONCLUSION

Intrathecal Dexmedetomidine has a longer duration of analgesia when compared to intrathecal Fentanyl. But the hemodynamic profile is better for Fentanyl in the initial period of block when compared to Dexmedetomidine.

KEYWORDS

Dexmedetomidine, Fentanyl, Bupivacaine, Subarachnoid Block.

HOW TO CITE THIS ARTICLE: Dhanya R, Nandan N, Morris LJ. Effect of adding dexmedetomidine versus fentanyl to intrathecal bupivacaine on spinal block characteristics in gynaecological procedures- A cohort study. J. Evid. Based Med. Healthc. 2017; 4(32), 1925-1928. DOI: 10.18410/jebmh/2017/376

BACKGROUND

It is well known that anaesthesia of choice for lower limb surgery and gynaecological procedures is subarachnoid block and the sensory level of T6-T10 is recommended to provide excellent anaesthesia for the patient.

It is well established that opioids[1] has got a prominent analgesic action at the spinal cord level and can be used safely for subarachnoid block. If we add an α-2 adrenoreceptor agonist like dexmedetomidine to hyperbaric bupivacaine, we can reduce the dose of bupivacaine without compromising the analgesic effect and also reduce the unwanted side effects of sympatholysis like hypotension. Thus, the combination of dexmedetomidine and bupivacaine put provide a more stable alternative than bupivacaine alone. Unlike opioids, dexmedetomidine is not a control drug, which needs strict licensing procedure.

Fentanyl is a potent synthetic narcotic analgesic is approximately 100 times more potent than morphine.

Gynaecological procedures like that vaginal hysterectomy, recanalisation and ovarian cystectomy can be done under regional anaesthesia.

Fentanyl in various doses 10, 20, 30, 40 μg when added to spinal bupivacaine increase the duration of analgesia and reduce intraoperative nausea and vomiting.[2,3] Dexmedetomidine is an α-2 adrenoreceptor agonist that is approved as an intravenous sedative and coanalgesic drug. It's use is often associated with decrease in BP and heart rate.[4] Most of the chemical studies about intrathecal α-2 agonist are related to clonidine and there is little in the literature about the use of intrathecal dexmedetomidine with local anaesthesia in humans. α_2:α_1

Financial or Other, Competing Interest: None.
Submission 10-04-2017, Peer Review 13-04-2017,
Acceptance 18-04-2017, Published 20-04-2017.
Corresponding Author:
Dr. Dhanya R,
H. No. 15, PSC Nagar, Neerazhi Lane,
Ulloor, Trivandrum Kerala- 695011, India.
E-mail: drrajeevv70@gmail.com
DOI: 10.18410/jebmh/2017/376

agonist activity for dexmedetomidine is 1600:1, but for clonidine α_2:α_1 agonist activity is 800:1.[5]

Kanazi el al[6] found that 3 μg dexmedetomidine and 30 μg clonidine are equipotent intrathecally when added to bupivacaine in patients undergoing urology procedures.[7] The same author found that dexmedetomidine and clonidine have significantly long duration of sensory and motor block than bupivacaine along without serious side effects.

The primary objective of the study is to measure the duration of analgesia by adding dexmedetomidine to bupivacaine compared to adding fentanyl to bupivacaine for subarachnoid block in gynaecological procedures.

MATERIALS AND METHODS

The study was conducted after obtaining approval of College Ethical Committee and written informed consent from all the patients. The study design was a cohort study. The period of study was 1 year done in a tertiary care center. Patients who had undergone elective gynaecological procedures like a total abdominal hysterectomy and bilateral salpingo-oophorectomy was study. All adult patients in the age group 20-80 years with the height of 155-175 cm in ASA I/II classification were included patients who had allergy to local anaesthetics with anatomical abnormalities of spine, peripheral neuropathy, bleeding disorders, psychiatric illness and serious systemic illness were excluded.

The sample size has been calculated using the formula-

$$n= [Z_{\alpha 1/2} + Z_{(1-\beta)}]^2 \times [(\Sigma_1^2 + \Sigma_2^2) / (\mu_1-\mu_2)2]$$

$\mu_1 = 274.8$ $\mu_2 = 179.5$ $\Sigma_1 = 73.5$ $\Sigma_2 = 47.4$

(Ref American Journal of Applied Sciences 6 (5): 882-887, 2009) the sample size is calculated 7 in each arm as the minimum for large sample size is 30; we take 30 samples in each arm.

Patients were divided into 2 Groups (Group A and Group B)

Group A received 3 cc of 0.5% bupivacaine (15 mg) (heavy) + 5 μg dexmedetomidine in 0.5 cc preservative free solution.

Group B received 3 cc of 0.5% bupivacaine (15 mg) (heavy) + 25 μg fentanyl in 0.5% cc preservative free solution.

All the consented patients were assessed in the preanaesthetic checkup clinic and those with a fasting period of 10 hours were given oral anxiolytics and oral anti-aspiration measures.

IV access using 18G cannula was secured and isotonic saline drip was started and patients were given midazolam in incremental doses. All the patients received lumbar puncture using 23G spinal needle and group A received 5 μg of dexmedetomidine (0.5 cc) with 0.5% 3 cc (15 mg) hyperbaric bupivacaine and group B received 25 μg (0.5) cc of fentanyl with 0.5% 3 cc (15 mL) of hyperbaric bupivacaine.

Study Variables

Study variables were duration of analgesia in terms of time of onset of mild pain postoperatively as reported by the patient and requesting analgesia (minutes). Haemodynamic profile of two groups (heart rate and systolic BP) patients receiving vasopressors. VAS score of more than 5 were given the escape analgesic - Injection Tramadol 50 mg and injection Perinorm 10 mg as IV bolus.

Heart rate and systolic BP were checked every minute for the first 20 minutes and every two minute for the next 20 minutes and every 5 minutes till end of surgery and then every 10-15 minutes for 6 hours postoperatively. Hypotension (defined as systolic blood pressure of <80 mmHg) was treated with 6 mg increments of IV ephedrine and 200 mL normal saline. Bradycardia (defined as heart rate <50 bpm) was treated with IV atropine 0.3-0.5 mg if associated with hypotension.

Data was analysed using computer software, Statistical Package for Social Sciences (SPSS) version 17. Data were expressed as mean standard deviation. The continuous covariants was compared in Student's t-tests. For all statistical evaluations, a two-tailed probability of value, P <0.05 was considered significant.

RESULTS

The patients in both group A and group B were compared with respect to the age, height and ASA classification. A p value of <0.05 was taken as significant. The nominal variables were compared with Chi-square test.

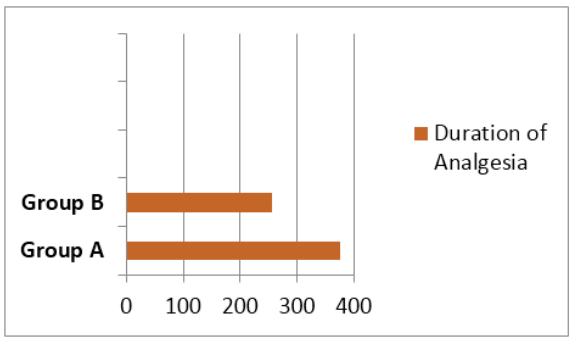
Parameter	Group	Mean ± SD	P value	Comments
Age (yrs.)	A	49.07 ± 10.91	>0.05	
	B	47.77 ± 12.70		Not significant
Height (cm)	A	162.03 ± 3.79	>0.05	
	B	162.60 ± 4.39		Not significant
ASA PS 1	A	10	>0.05	
	B	7		Not significant
ASA PS 2	A	20	>0.05	
	B	23		Not significant

Table 1. Baseline Variables (Continuous)

Duration of analgesia is the primary outcome of the study. The duration of analgesia was measured from time of giving lumbar subarachnoid block to time when patient first complained of pain. The means of both groups were compared with unpaired t-test. The duration of analgesia was found to be significantly longer in group A when compared to group B.

Group	Mean	±SD	t value	P value	Comments
Group A	375.50	9.19	48.5	<0.001	Clinically significant
Group B	256.87	9.72			

Table 2. Duration of Analgesia (Minutes)



Graph 1. Duration of Analgesia (Minutes)

Haemodynamic profile was assessed by measuring heart rate and systolic blood pressure after measuring the baseline values. The use of vasopressor was used to assess the incidence of hypotension in both groups. The continuous variables work was compared with means and significant tested unpaired t-test. The use of vasopressor was compared with Chi-square test. The heart rates were consistently lower in Group A than Group B. The use of vasopressor was higher in group A and B.

Heart rate	Group	Mean Beats/Min.	±SD	t value	P value	Comments
Baseline	A	71.33	10.04	0.60	>0.05	Not significant
	B	70.00	6.87			
0.5 mins.	A	65.20	8.12	-2.39	<0.05	Clinically significant
	B	70.80	9.9			
5-10 mins.	A	64.93	7.1	-3.02	<0.05	Clinically significant
	B	72.00	10.7			
10-15 mins.	A	67.63	7.40	-2.37	<0.05	Clinically significant
	B	72.90	9.61			
15-20 mins.	A	68.17	8.33	-2.30	<0.05	Clinically significant
	B	73.20	8.57			
20-30 mins.	A	68.97	7.77	-2.08	<0.05	Clinically significant
	B	73.20	7.99			

Table 3. Heart Rate (Beats/Min.)

After 30 minutes to the end of surgery and 6 hours postoperatively, heart rate variation was clinically not significantly both groups.

Systolic Blood Pressure	Group	mm of Hg	± SD	t value	P value	Comments
Baseline	A	137.60	10.24	0.045	>0.05	Not significant
	B	137.47	12.63			
0-5 mins.	A	108.60	11.13	-2.61	<0.05	Clinically significant
	B	118.73	18.11			
5-10 mins.	A	94.47	18.77	-4.10	<0.05	Clinically significant
	B	111.27	12.25			
10-15 mins.	A	98.73	12.14	-4.52	<0.05	Clinically significant
	B	112.87	12.04			
15-20 mins.	A	102.53	15.90	-2.96	<0.05	Clinically significant
	B	113.07	11.21			

Table 4. Systolic Blood Pressure (mm of Hg)

After 20 minutes till 6 hours postoperatively, there was clinically not significant variation in systolic BP.

Vasopressor	Group A	Group B
Nil	14	28
1 time	7	0
2 times	0	2
3 times	5	0
4 times	4	0

Table 5. Vasopressor Use

Chi-square = 22.66; P<0.05; Comment = Significant.

DISCUSSION

The result of the study shows that the supplementation of bupivacaine with 5 μg of dexmedetomidine significantly prolonged sensory block compared with intrathecal bupivacaine alone. Al Ghanem et al[8] studied the effect of adding dexmedetomidine versus fentanyl to intrathecal bupivacaine on spinal block in gynaecological procedures. The study evaluated the duration of analgesia in patients who received 10 mg isobaric bupivacaine + 5 μg dexmedetomidine and in patients who received 10 mg isobaric bupivacaine + 25 μg fentanyl. The results showed that the dexmedetomidine group had longer duration of analgesia than the fentanyl group. In the present study and based on the above study's findings, dexmedetomidine in a dose on 5 μg was used for supplementation of spinal bupivacaine showed duration of analgesia to be 375.5 ± 9.19 minutes when compared to supplementation of bupivacaine with 25 μg fentanyl, which was found to be 255.87 ± 9.72 minutes (P <0.01), which is highly

significant. Increased duration when compared to the parent study is due to the increased volume of total drug used in the present study. In studies by Rajni Gupta et al,[9] the duration of analgesia with dexmedetomidine was significantly lower than with fentanyl. Although, in present study, the blood pressure and heart rates was significantly lower in dexmedetomidine group than fentanyl group in the first hour giving spinal, side effect were significant. The haemodynamic profile of both fentanyl and dexmedetomidine group was found to be good in studies by Rajni Gupta et al.[9]

In the present study, the dexmedetomidine group had poor haemodynamic profile as evidence by increased use of vasopressors and lower recording of heart rate and blood pressure. This may be due to the fact that in the present study a higher intrathecal volume of 3.5 mL was used as opposed to lower volumes in studies by Rajni Gupta et al.[9]

CONCLUSION

Our study showed that addition of 5 μg of dexmedetomidine to 3 cc hyperbaric bupivacaine 0.5% is associated with prolonged duration of analgesia. It's seen to be a good alternative to intrathecal fentanyl since it produced prolonged duration block and this is more suitable for major surgeries on the abdomen and lower extremities. The haemodynamic profile of fentanyl group was better than dexmedetomidine group.

REFERENCES

[1] Fakuda K. Opioids. In: Millers RD, ed. Miller's anesthesia. 7th edn. Elsevier Saunders 2009:769-824.

[2] Goel S, Bhardwaj N, Grover VK. Intrathecal fentanyl added to intrathecal bupivacaine for day case surgery. European Journal of Anesthesia 2003;20(4):294-297.

[3] Ben-David B, Soloman E, Levin H, et al. Intrathecal fentanyl with small dose of dilute bupivacaine better anesthesia without prolonging recovery. Anesthesia Analgesia 1997:85(3):560-565.

[4] Bloor BC, Ward DS, Belleville JP, et al. Effects of intravenous dexmedetomidine in humans. II. Hemodynamic changes. Anesthesiology 1992;77(6):1134-1142.

[5] Glick DB. Autonomic nervous system. In: Millers RD, Eriksson LI, Fleisher LA, et al. Miller's anesthesia. 8th edn. Elsevier Saunders 2015:360-369.

[6] Kanazi GE, Aouad MT, Jabbour-Khoury SI, et al. Effect of low dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. Acta Anesthesiol Scand 2006;50(2):222-227.

[7] Timothy Black, Lovrinecevic M. Anesthesia for urologic procedures. In: Healy TE, Knight PR, eds. Wylie & Churchill Davidson's a practise of anesthesia. 7th edn. London: Arnold 2002:p. 910.

[8] MAl Ghanem, Massad IM, Al-Mustafa MM, et al. Effects of adding dexmedetomidine versus fentanyl to intrathecal bupivacaine on spinal block characteristics in gynaecologic procedures. A double blind controlled study. American Journal of Applied Sciences 2009;6(5):882-887.

[9] Gupta R, Verma R**,** Bogra J**,** et al. A comparative study of intrathecal dexmedetomidine and fentanyl as adjuvants to bupivacaine. J Anesthesiol Clin Pharmacol 2011;27(3):339-343.