Original Article

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Comparative Study of Analgesic Efficacy of Ropivacaine with Ropivacaine plus Dexmedetomidine for Epidural Block in Abdominal Hysterectomy Surgery

Rakesh Karnawat*, Ghansham Biyani, Sadiq Mohammed***, Meenal Agarwal******

Abstract

Background: Efforts to find a better adjuvant in regional anaesthesia are underway since long.Aims and objectives are to compare the efficacy of epidural block with ropivacaine or ropivacaine plus dexmedetomidine for relief of post operative pain in patients undergoing abdominal hysterectomy surgery. **Methodology:** Sixty adult patients of ASA grade I & II, undergoing abdominal hysterectomy surgery were included in this prospective, randomized study. After placing the catheter in L1-L2 epidural space, block was randomly activated either by 18 ml of ropivacaine 0.25% (Group I) or by 18 ml of ropivacaine 0.25% plus 1µg/kg dexmedetomedine (Group II). General anaesthesia was instituted in all patients using a standardised technique. After recovery from GA, pain was assessed by VAS. The patients were administered first top up dose through epidural route as soon as VAS score exceeded 3 and time was noted for duration of analgesia. Total requirement of ropivacaine in 24 hours was also noted. **Result:** Mean duration of analgesia was longer in Group II (318.14±54.35 min) as compared to Group I (146.21 ±30.64 min) ($p<0.05$). Mean total consumption of ropivacaine was 89.42±12.32 mg in Group II and 122.36(14.26) mg in Group I ($p< 0.05$). **Conclusion:** Addition of dexmedetomidine to local anaesthetic agent ropivacaine significantly prolongs the duration of analgesia in epidural blocks.

Keywords: Epidural block; Ropivacaine;

Introduction

Surgical methods and the anaesthetic techniques have evolved and improved drastically over the last two decades. Many techniques and drug regimens, with partial or greater success, have been tried from time to time to calm the patients and to eliminate the pain post operatively. Surgical pain is a universal phenomenon affecting all patients in the intraoperative and postoperative period. Apart from an agonizing sensory experience associated with it, acute pain has several deleterious effects on the physique and the psyche of the sufferer.[1] An anticipation of these effects combined with a humanitarian urge to relieve pain, play a pivotal role in provision and optimization of postoperative analgesia.

In this study, we compared post operative analgesia after epidural nerve block by ropivacaine 0.25% alone with ropivacaine 0.25% plus dexmedetomidine1µg/Kg, in patients undergoing abdominal hysterectomy surgery. Total requirement of ropivacaine in first 24 hours was also compared between two groups.

Author's Affiliations: *Professor,***Assistant Professor,****Sr. Resident, Dept.of Anaesthesia, Dr. S.N. Medical College, Jodhpur, Rajasthan, India.**Sr. Resident, AIIMS, Jodhpur, Rajasthan, India.

Corresponding Author: Dr. Rakesh Karnawat MD, Professor, Dept. of Anaesthesia, Dr. S.N. Medical College, Jodhpur, Rajasthan, India.

E-mail: dr.rakeshkarnawat@yahoo.com

Methodology

This prospective, randomized, controlled, parallel group, study was carried out at Umaid hospital, Dr. S.N. Medical College Jodhpur. After obtaining the permission of appropriate authority of the institute and written consent from patients, 60 female patients of ASA (American Society of Anaesthesiologists) grade I and II between the ages of 44 and 60 years were enrolled for the study that underwent abdominal hysterectomy surgeries. The patients with haematological disease, bleeding or coagulation test abnormalities, psychiatric diseases, diabetes, Unwilling patients, history of drug abuse and allergy to local anaesthetics of the amide type were excluded from the study.

After transferring the patients into the operating room,ASA standard monitors (five lead ECG, pulse oximetry (SpO2), capnography and automated non-invasive blood pressure monitor) were attached and baseline parameters were noted down. Intravenous cannulation was done and infusion of Lactated Ringer (RL) was started at a rate of 2 ml/kg/h. Thereafter in sitting posture, under strict aseptic precautions and after infiltration with local anaesthetic, Patients were administered epidural block with 18 gauge Touhy needle and, a multiorifice 18G epidural catheter was secured 3–4 cm into epidural space (L1-L2) and after negative aspiration for blood, CSF and air,a test dose of 3 ml of 2% lignocaine hydrochloride solution containing adrenaline 1:200,000 was injected through the epidural catheter. Patients were put back to horizontal supine position and, block was activated either by 18 ml of 0.25% ropivacaine.[2] (Group I) or by 18 ml of ropivacaine (0.25%) and 1µg/Kg dexmedetomidine.[3](Group II). Patients were induced with injection propofol and endotracheal intubation was facilitated by injection rocuronium bromide 1mg/Kg body weight. Anaesthesia was maintained with O_2, N_2O and 1 MAC of Isoflurane. At the end of surgery residual neuromuscular blockade was reversed with 50 µg/Kg neostigmine with 10 µg/Kg glycopyrrolate.

In PACU, patients were assessed for severity of pain using VAS. When VAS score exceeded 3, the time was noted and top up doses of 0.25% ropivacaine (6ml) (Group I) or ropivacaine (6ml) and dexmedetomidine (0.25 µg/Kg) (Group II) were administered. Total requirement of ropivacaine in the first 24 hrs was also noted in both the groups.

Results

A total of 60 patients who underwent abdominal hysterectomy surgery were enrolled for the study and were randomly divided into two groups. The demographic profiles of the patients in both the groups were comparable with regards to age and ASA status, which was similar in both the groups and there was no statistically significant difference among both the groups in terms of demographic data ($p>0.05$) (Table I).

Table 2 compares the haemodynamics changes between the groups at various time points. The baseline systolic and diastolic blood pressures and the pulse rates were comparable ($p>0.05$) between Group I and II and showed no significant differences.Mean SBP (baseline) in group I was 126.40 mm Hg and in group II 128.48 mm Hg and mean pulse rate (baseline) in Group I was 74.26 bpm and in Group II 70.42 bpm. The change in systolic blood pressure and pulse rate at the time of skin incision was significantly less in dexmedetomidine group i.e Group II ($P<0.02$) where as diastolic blood pressure was comparable.

Table I: Demographic Profile

Parameter	Group I	Group II
Number of Patients	30	30
ASA Grade I/II	12/18	14/16
Age in Years (mean±SD)	49.11±09.2	52.42±06.9

Table II: Comparison of haemodynamic parameters between the group

Time Point	SBP		DBP		PR	
	Group I	Group II	Group I	Group II	Group I	Group II
Baseline	126.40	128.48	74.62	78.03	74.26	70.42
At skin incision	134.14*	126.12	78.04	72.25	**93.41***	**72.17**
Immediate Post-op	118.36	121.71	76.17	74.23	71.75	71.79
1 Hr Post-op	117.88	120.56	74.43	74.14	70.62	70.75
2 Hr Post-op	124.24*	116.12*	74.74	72.75	70.25	71.25
4 Hr Post-op	120.86	119.34	70.00	72.28	69.14	71.71
8 Hr Post-op	121.44	123.06	71.62	71.69	70.72	70.57
16 Hr Post-op	124.62	121.72	70.67	70.07	69.62	68.86
24 Hr Post-op	122.14	118.06	74.34	70.09	69.24	69.07

Table III: Comparison of postoperative VAS scores in two groups

Intensity of Postoperative Pain	Group 1	Group II	p value
Immediate Postoperative Period	1.45±0.20	2.05±0.18	0.4120
After 1 hour	4.75±031	2.96±0.64	0.0000
After 2 hour	2.55±0.24	3.82±0.34	0.0324
After 4 hour	5.03±0.28	2.67±0.64	0.0004
After 8 hour	5.34±0.35	3.24±0.34	0.0001
After 16 hour	4.79±0.34	3.04±0.28	0.0001

Table IV: Comparison of duration of analgesia and total ropivacaine consumption in 24 hours

Group	Group I (mean±SD)	Group II (mean±SD)	P value
Duration of analgesia (minutes)	146.21(30.64)	318.14(54.35)	< 0.0001
Ropivacaine consumption in 24 hrs	122.36(14.26)	89.42(12.32)	

The readings again became comparable in the immediate postoperative period, 1st, 4th, 8th, 16th and 24th hours postoperatively in both the groups (p>0.05). However significant fall in SBP was observed at 2nd hour of postoperative period whereas DBP did not. VAS were comparable in the immediate post operative period but after that it became significantly higher VAS in Group I on all the post operative recordings, also in the group II significant change occurred across time (Table 3).

A statistically significant (p<0.05) increase in the mean and maximum duration of analgesia was found in Group II [318 and 442 min] in comparison to Group I [146 and 202 min].Requirement of ropivacaine in the first 24 hours of post operative period was significantly less in Group II (89 mg) as compared to

Group I (122 mg) (P value 0.001) as shown in Table 4.

Discussion

The use of neuraxial opioids is associated with quite a few side effects, so various options including á-2 agonists are being extensively evaluated as an alternative with emphasis on opioid-related side effects such as respiratory depression, nausea, urinary retention and pruritis.[4-6] The pharmacologic properties of á-2 agonists have been extensively studied and have been employed clinically to achieve the desired effects in regional anaesthesia.[7-10] Epidural administration of these drugs is associated with sedation, analgesia, anxiolysis, hypnosis, sympatholysis, and anaesthetic-sparing effects.[11,12] Clonidine has been used successfully over the last decade for the said purpose and the introduction of dexmedetomidine has further widened the scope of á-2 agonists in regional anaesthesia . Dexmedetomidine is a more selective $á_2$ agonist with a greater selectivity for the $á_2$ receptors than the $á_1$ receptors.[13] It was introduced in clinical practice in the United States in 1999 and approved by the FDA only as a short-term (<24 hours) sedative.[14,15] Dexmedetomidine has also been reported to enhance central and peripheral neural blockades by local anesthetics. At the spinal cord level, stimulation of $alpha_2$ receptors at the substantia gelatinosa of the dorsal horn leads to inhibition of the firing of nociceptive neurons and inhibition of the release of substance P.[16] Alpha2-adrenoceptors located at the nerve endings have a possible role in the analgesic mechanisms by preventing Norepinephrine release. The spinal mechanism is the principal mechanism for the analgesic action of dexmedetomidine even though there is a clear evidence for both a supraspinal and peripheral sites of action.[17]

The faster onset of action of local anaesthetics, rapid establishment of both sensory and motor blockade, prolonged duration of analgesia into the post-operative period, dose-sparing action of local anaesthetics and stable cardiovascular parameters makes these agents a very effective adjuvant in regional anaesthesia.

The present study was undertaken to compare the analgesic efficacy, peri-operative and post-operative, as well as sedation effects of á-2 agonists. The demographic profile of our patients was comparable with respect to mean age, body weight, body mass index, ASA grade and duration of surgery. The results of the study has shown that the addition of 1.0 ìg/kg dexmedetomidine as adjuvant to epidural ropivacaine not only prolongs the duration of analgesia but also provides a good sedation level during the surgical procedure. Dexmedetomidine enables an earlier onset and establishment of sensory and motor block. Further, addition of these adjuvants promotes faster onset compared to established time of onset of sensory analgesia with ropivacaine alone.

In our study, we found that dexmedetomidine enhanced the local anesthetic action of ropivacaine when administered epidurally. Aliye Esmaoglu *et al*[19] studied the effect of addition of dexmedetomidine to levobupivacaine in axillary brachial plexus block and they found shortening of onset of time of levobupivacaine and prolongation of duration of block and post operative analgesia. A.M El-Hennawy *et al*[18] in a study in 2009 used dexmedetomedine 2 µg/Kg through caudal route. Bajwa *et al*[20] used 1.5 µg/kg of dexmedetomedine in epidural route. Based on these observations, we

administered 1 µg/Kg of dexmeditomedine initially, to be followed by top up dosage of 12.5 µg, along with ropivacaine as an adjuvant.

Dexmedetomidine causes bradycardia, so the pulse rate in patients of dexmedetomidine group decreased significantly over time but inter group variation was not significant. Also SBP in dexmedetomidine group decreased significantly over time but DBP did not. However, clinically,there was no significant haemodynamic instability and none of the patients required any active intervention.

Conclusion

Epidural administration of ropivacaine along with dexmedetomidine provides prolonged post operative analgesia without causing significant haemodynamic instability. Also co administration of dexmedetomidine leads to decreased total consumption of ropivacaine.

Statistical analysis

Statistica version 6 [Tulsa, Oklahoma: StatSoft Inc., 2001] was used to analyse the data. Comparison of numerical variables between the groups was done by Student's unpaired t test. Comparison of categorical variables between groups was done by Fischer's exact test. Repeated measures ANOVA with post-hoc Tukey's test and Dunn's test was used for change of haemodynamics within groups and to see the changes of VAS over time.

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