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Comparative Study between Ropivacaine 0.2% Versus Bupivacaine 0.2% in Epidural Labor Analgesia

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Abstract

Introduction: The epidural analgesia is popular and effective method of labour analgesia since the parturient remains awake, pain free and comfortable, watches her delivery and immediately can feed her baby. Bupivacaine is causes cardio toxicity and the discomfort due to motor blockade that limits its use. Motor blockade reduces her mobility and increase the chances of assisted deliveries. Ropivacaine induces less lower extremity motor blockade and has a lower potential for cardiovascular and central nervous system toxicity. *Material and Methods:* A total of 90 patients were included in the study, of which 45 patients were randomly allocated to each one of the ropivacaine or bupivacaine group. In ropivacaine group patient Inj. Ropivacaine 0.2% vol. 8 to 10 ml and in Bupivacaine group Inj. Bupivacaine 0.2% 8 to 10 ml a bolus dose was given. Adequate analgesia visual analogue scale [VAS] of 3 was considered as an endpoint. Intermittent bolus doses were given of 50% of initial bolus dose on SOS basis which was on an average 1 to 1.5 hrs after initial dose. Vital parameters, VAS score, motor block was noted. *Results:* The VAS score in Ropivacaine 0.2% group was excellent i.e. 0 to 3 in 38 (84.4%) patients , out of which 26 patients were absolutely pain free after 15 mins of the bolus dose. Among the Bupivacaine group excellent score AVS < 3 was found in 29 (64.5%) patients. 18 parturients (40%) in the Bupivacaine group and 35 (77.8%) in the Ropivacaine group did not show any motor block (Bromage=0) throughout labour. The study showed that 21 (46.7%) patients of Bupivacaine group and 25 (55.5%) patients of ropivacaine group delivered spontaneous vaginal delivery and 18 (40%) patients of Bupivacaine group and 13(28.8%) patients of ropivacaine group delivered with instrumental vaginal delivery. There was no significant difference in the outcome or the mode of delivery in both the groups. The delivery time was shortened in both the groups. *Conclusion:* It can be concluded that both the drugs are effective in producing labor analgesia. Ropivacaine group parturients; had a faster onset and significantly longer duration of analgesia with a single dose and required lesser top-ups and there was less motor blockade.

Keywords: Epidural; Ropivacaine; Bupivacaine; Labour Analgesia; Motor Block.

Introduction

Epidural analgesia is popular and effective method of pain control during labor. It is an attractive method to parturient because she remains awake, pain free and comfortable, watch her delivery and immediately can interact her baby. Bupivacaine is well proven drug for labor analgesia but because of its cardio toxicity and the discomfort due to motor blockade, imposes limitation for its usefulness. Motor blockade reduces her mobility and is associated with maternal dissatisfaction and has been shown to increase the assisted deliveries, i.e. forceps, vacuum application and surgical delivery [1,2]. Ropivacaine, an amino acid local anaesthetic structurally related to bupivacaine but Ropivacaine is stereoisomer and bupivacaine is racemic mixture. It is less lipophylic and hence chance of motor block is less as compared to bupivacaine. This reduced lipophylicity makes it less likely to cause CNS and cardiotoxicity. Ropivacaine might be superior to bupivacaine for epidural labor analgesia because it appears to induce

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less lower extremity motor blockade due to its more selectivity towards the sensory fibers. The clinical relevance of this difference is not yet clear [3,4]. In Ropivacaine, an amino-amide local anaesthetic that is structurally similar to bupivacaine has a lower potential for cardiovascular and central nervous system toxicity [5]. A meta-analysis of studies comparing higher concentrations of Ropivacaine and bupivacaine (0.25%-0.5%) suggested that the use of Ropivacaine was associated with less instrumental deliveries and less motor blockade than bupivacaine [6]. The purpose of present study is to compare analgesic potency and the level of motor blocked of the Ropivacaine 0.2% with Bupivacaine 0.2% in labor analgesia.

Material and Methods

A total of 90 patients were included in the study during the study period from January 2014 to December 2105 coming for delivery at JIIU's IMSR Medical College and Hospital, Warudi, Jalna. Inclusion criteria was: written informed consent, ASA status I or II, nullipara or G2P1, singleton pregnancy, vertex presentation and cervical dilatation of 2 to 4 cm. Exclusion criteria were: refusal to participate in the study, contraindications for epidural anaesthesia, allergy to amide local anaesthetics, multi-parity, multi-fetal gestations, pre-term pregnancy, patients with associated cardiac or systemic illness and those who did not get pain relief at all in whom the catheter was replaced, less than 38th week of gestation and cervical dilation of more than 5 cm at the time of epidural catheter placement. All the base line investigations including coagulation profile was noted and were within normal limits and after obtaining written informed valid consent, and confirmation of the cervical dilatation of 2 to 4 cm, the parturient was positioned in a left lateral position. The epidural space was identified at L4/5, L5-S1, or L3/4 with an 18-gauge Tuohy's needle using the loss of resistance technique to 0.9% saline. A 20-gauge triple orifice epidural catheter (Portex/ B brown) was inserted 2-4 cm into the epidural space. After a negative test dose of 60 mg Lidocaine 2%,with Adrenaline 1 in 2,00,000 the study solution i.e. Inj. Ropivacaine 0.2% vol. 8 to 10 ml, in Ropivacaine group patients and Inj. Bupivacaine 0.2% 8 to 10 ml a bolus dose depending on height of patient, was injected in Bupivacaine group patients. Adequate analgesia (visual analogue scale [VAS] of 3 was considered as an endpoint. Intermittent bolus doses were given of 50 % of initial bolus dose on SOS basis which was on an average 1 to 1.5 hrs after initial dose. Initial dose and time required to reach VAS 3 were noted. Vital parameters, VAS score, motor block (modified Bromage scale) [7] i.e. 0 : Normal movement in hip, knee and foot ; 1: Weakness in hip muscle; 2: Weakness of the knee muscles; 3: Motor block of hip, knee and foot and sensory level of anaesthesia were recorded after 15, 30 and 60 min and then every 60 min. Inadequate analgesia was defined as VAS > 3 and treated with incremental interventions: a 5 ml bolus of the study solution, If insufficient analgesia persisted, the patient was excluded from the study and the catheter had to be recited.

Results

The VAS score in Ropivacaine 0.2% group was excellent i.e. 0 to 3 in 38 (84.4%) patients , out of which 26 patients were absolutely pain free after 15 mins of the bolus dose, VAS = 0, and 7 patients having VAS =1, 2 having VAS =2 and 3 patients having VAS =3. The remaining 7 (15.6%) patients needed another 5 ml dose to reduce the VAS < 3. Among the Bupivacaine group excellent score AVS < 3 was found in 29 (64.5%) patients and VAS was > 4 in 16 (35.5%) patients after 15 mins of a first bolus dose of 8 to 10 ml of Inj.Bupivacaine 0.2% Which reduced to < 3 after giving additional 5 ml dose of the Inj.Bupivacaine 0.2%. There was no need to give local anesthesia for the incision for episiotomy in more number of patients in Ropivacaine group than in bupivacaine group. The difference between the two groups was statistically significant ($p< 0.05$).

The table shows that 18 parturients (40%) in the Bupivacaine group and 35 (77.8%) in the Ropivacaine group did not show any motor block (Bromage = 0) throughout labour. As parturients with epidural analgesia were not mobilized at the time the study was performed, mobilization was not attempted in 48 parturients (53%). Rest of the patients was moved to the waiting room. The 15 patients in Bupivacaine group experienced severe tingling and numbness in foot and were not able to move. The difference between the two groups was statistically significant ($p< 0.05$).

The Table shows that 21(46.7%) patients of Bupivacaine group and 25 (55.5%) patients of ropivacaine group delivered spontaneous vaginal delivery and 18 (40%) patients of Bupivacaine group and 13 (28.8%) patients of ropivacaine group delivered with instrumental vaginal delivery.

There was no significant difference in the outcome or the mode of delivery in both the groups. The

APGAR score in both groups was comparable, though the fetal heart rate was dropped in Bupivacaine group as compared with Ropivacaine group after giving the first bolus dose of epidural analgesia. The delivery time was shortened in both the groups.

Table 1: Distribution of patients according to the VAS scale

VAS scale at 15 mins	Ropivacaine 0.2% (n=45)	Bupivacaine 0.2% (n=45)
Less than 3 i.e. Satisfactory analgesia	38 (84.4%),	29 (64.5%)
More than 3 i.e. Unsatisfactory analgesia	7 (15.6%)	16 (35.5%)

χ^2=4.731, P = 0.029

Table 2: Distribution of patients according to the motor block

	Maximal Motor Block	
	Bupivacaine N = 45	Ropivacaine N = 45
Bromage 0	18(40%)	35(77.8%)
Bromage 1	18(40%)	10(22.2%)
Bromage 2	9(20%)	00
Bromage 3	00	00

(χ^2=13.691, p =0.00).

Table 3: Distribution of patients according to the type of delivery of baby

	Bupivacaine n = 45	Ropivacaine n = 45	Total
Spontaneous vaginal delivery	21(46.7%)	25(55.5%)	46(51.11%)
Instrumental vaginal delivery	18(40%)	13(28.8%)	31(34.44%)
Caesarean section	6(13.3%)	7(15.5%)	13(14.44%)

χ^2 = 0.712, p=0.70

Discussion

In the present study, the analgesic effect and the motor blockade by the Inj Ropivacaine 0.2% and Inj Bupivacaine 0.2% in epidural labor analgesia were compared. In the present study it was found that the VAS score in Ropivacaine 0.2% group was excellent i.e. 0 to 3 in 38(84.4%) patients, out of which 26 patients were absolutely pain free after 15 mins of the bolus dose, VAS = 0, and 7 patients having VAS =1, 2 having VAS =2 and 3 patients having VAS =3. The remaining 7 (15.6%) patients needed another 5 ml dose to reduce the VAS < 3. Among the Bupivacaine group excellent score AVS < 3 was found in 29 (64.5%) patients and VAS was > 4 in 16 (35.5%) patients after 15 mins of first bolus dose of 8 to 10 ml of Inj.Bupivacaine 0.2% Which reduced to < 3 after giving additional 5 ml dose of the Inj.Bupivacaine 0.2%. There was no need to give local anaesthesia for the incision for episiotomy in more number of patients in Ropivacaine group than in bupivacaine group. The difference between the two groups was statistically significant. (p< 0.05)

In a study by Halpern SH et al (2003)6, they found that satisfaction for analgesia at delivery was higher for bupivacaine than for ropivacaine (mean +/- SD: 71 +/- 25 vs. 66 +/- 26, respectively; P = 0.037). While, in a study by M. Dresner et al(2000)8, patients receiving ropivacaine received fewer routine top-ups (median 1.0 vs. 2.0, P=0.001) and fewer escape top-ups (9.8% vs. 21.8%, P=0.02). The ropivacaine group was more pain-free in the first stage (51% vs. 33.7%, P=0.01). There were no significant differences in patients' assessment of motor block or mode of delivery between the groups. Pain relief and satisfaction scores from midwives and patients were consistently better in the ropivacaine group but did not reach statistical significance. They summarized that 0.2% ropivacaine is a suitable choice for labour epidurals. These findings are similar to our study.

In the present study, 18 parturients (40%) in the Bupivacaine group and 35 (77.8%) in the Ropivacaine group did not show any motor block (Bromage = 0) throughout labour. As parturients with epidural analgesia were not mobilized at the time the study was performed, mobilization was not attempted in 48 parturients (53%). Rest of the patients was moved to the waiting room. The 15 patients in Bupivacaine group experienced severe tingling and numbness in foot and were not able to move. The difference between the two groups was statistically significant. (p< 0.05)

In a study by Gautier P et al (1999)9, they found that after the third epidural injection, patients in the ropivacaine group experienced significantly less severe motor blockade than patients in the initial bupivacaine 0.125% group. At this point, 93% of the patients in the ropivacaine group were free from motor impairment versus 66% in the bupivacaine group ($P<0.05$). We had similar findings from our study. Similarly in a study by Halpern SH(2003)6 the incidence of motor block was significantly increased in the bupivacaine group compared with the ropivacaine group at 6 h (47 of 93 vs. 29 of 93, respectively; $P = 0.006$) and 10 h (29 of 47 vs. 16 of 41, respectively; $P = 0.03$) after injection. Satisfaction with mobility was higher with ropivacaine than with bupivacaine (mean± SD: 76 ±23 vs. 72 ±23, respectively; $P = 0.013$). In an another study by Snigdha Paddalwar (2013) 2, Ropivacaine showed no difference in the mean VAS scores and the quality of analgesia, as compared to Bupivacaine. At 20 min, all the patients in both groups were absolutely pain-free with the VAS score of 0. No patient in group R developed motor block, whereas five patients in group B developed grade 2 (mild) motor block. APGAR scores were comparable in both the groups. They conclude that Ropivacaine is equipotent, produces less motor block, has no adverse effect on the course and duration of labor, and can be used safely. Also Zaric D(1996)10 concluded that Ropivacaine 0.1% produced limited analgesia and minimal motor block so that ambulation was possible throughout the investigation. With 0.2 and 0.3% ropivacaine, analgesia was more extensive, and motor block was considered moderate.

In the present study, 21(46.7%) patients of Bupivacaine group and 25(55.5%) patients of ropivacaine group delivered spontaneous vaginal delivery and 18(40%) patients of Bupivacaine group and 13(28.8%) patients of ropivacaine group delivered with instrumental vaginal delivery.

There was no significant difference in the outcome or the mode of delivery in both the groups. The APGAR score in both groups was comparable, though the fetal heart rate was dropped in Bupivacaine group as compared with Ropivacaine group after giving the first bolus dose of epidural analgesia. The delivery time was shortened in both the groups. In a study by Halpern SH(2003)6 there was no difference in the incidence of operative delivery between the two groups (148 of 276 bupivacaine recipients vs. 135 of 279 ropivacaine recipients; $P = 0.25$) or any obstetric or neonatal outcome. Similarly, several studies have compared bupivacaine and ropivacaine for labour analgesia. They were recently summarized in a meta-analysis by Halpern et al (2003)11. In 19 of 23 studies analyzed, the motor block was more frequent in the bupivacaine group than in the ropivacaine group. However, the motor block was not included in their meta-analysis because data were heterogeneous. Nevertheless, these results are consistent with the trend towards less motor block with ropivacaine, also observed in our study. In a study by Lacassie, H. J(2002)12, concluded that epidural ropivacaine is less potent than epidural bupivacaine in producing motor blockade during labor. The motor block potency relation is similar to the sensory potency ratio for these two drugs.

Conclusion

It can be concluded that both the drugs are effective in producing labor analgesia. However the ropivacaine group parturients; had a faster onset and significantly longer duration of analgesia with a single dose and required lesser top-ups and there was less motor blockade. Hence, our study favors, the use of 15 ml of 0.2% ropivacaine over 0.2% bupivacaine for labor analgesia.

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