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Continuous epidural infusion of ropivacaine-fentanyl-epinephrine for post-C/S pain: What is the optimal concentration of ropivacaine?

Barsoum S, Uzun N, Mohiuddin R, Yama A, Grosu V, Chaudhry N, Spears L
UMDNJ-RWJMS, New Brunswick, NJ USA

Introduction: The manufacturer of ropivacaine recommends that a 0.2% concentration be used without adjuvants. However, addition of opioids and epinephrine to local anesthetics improves the quality of epidural analgesia while minimizing motor block¹. This study was designed to compare the effect of four concentrations of ropivacaine mixed with fixed concentrations of fentanyl and epinephrine in parturients post-C/S with regard to analgesia, motor block, and maternal side effects.

Methods: Following IRB approval and informed consent, 60 parturients were studied. In a double blind design, patients were randomized into one of four groups. Upon arrival to PACU and after a test dose of 3 ml 1.5% lidocaine + 5 µg/ml epinephrine, patients received 10ml/hr of the study solution. Subjects in Groups I, II, III and IV received 0.2 mg, 0.1 mg, 0.05 mg, and 0.025 mg of ropivacaine. In addition, all subjects received identical doses of fentanyl (3µg/ml) and epinephrine (1µg/ml). Patients could administer a PCA dose of 4 ml with lockout time of 10 min (Abbott Life Care PCA pump). Parturients received patient-administered IV naloxone via PCA device, 0.04 mg (5 ml) and a lockout time of 5 min. The patients were evaluated at 1 hr, 2 hr, 4 hr, and then every 4 hr for 48 hours for VAS pain scores, sedation, pruritus, nausea, vomiting, back pressure, cramps, and urinary retention. If VAS was > 3, patients were given a 5 -10 ml bolus of the study solution every 10 min to a maximum of 20 ml and the infusion rate was increased by 2 ml/hr to a maximum of 25 ml/hour. Pain, side effects, and overall satisfaction were assessed with 10-point scales. Data were expressed as mean ± SD & statistical analysis was performed with ANOVA or Fisher's exact test as appropriate at p< 0.05.

Results: There were no differences among the groups with respect to sedation, pruritus, nausea, vomiting, back pressure, cramps, or time to liquid diet. Nine (I<III & IV, p<0.004), five (II<IV, p<0.04), one, and zero patients in groups I-IV respectively, asked to be removed from the study the next day for not being able to ambulate. 24-hour pain at rest scores were 3.7 ± 2.1 (I>III & IV, p<0.004), 2.2 ± 1.9 , 1.1 ± 1.4 , and 0.9 ± 1.7 for groups I - IV respectively. Nine, nine, two (III<I & II, p<0.02), and zero (IV<I & II, p<0.0008) patients were reported to have urinary retention for groups I - IV respectively. Overall satisfaction scores were 8.4 ± 2.6 , 8.5 ± 1.9 , 8.8 ± 0.9 , and 9.8 ± 0.6 (IV>I & II, p<0.03) for groups I-IV respectively. No neonate had Apgar score < 8 at 5 min. Neonatal neurobehavioral assessment score was ≥ 35 (max. score = 40) for all infants at 1 & 24 hrs. Infusion characteristics are shown in Table 1.

Conclusion: The addition of fentanyl & epinephrine to the optimal epidural-PCA concentration of 0.025% ropivacaine for post-c/s pain in our study provided the best analgesia without sensory or motor loss or urinary retention while increasing epidural-PCA and IV naloxone dose requirements.

Reference: 1. Br. J. Anesth. 59: 1518, 1987.

Table 1: Infusion characteristics

	Infusion Duration	Total Vol 24 hr	PCA Vol 24 hr	PCA Attempts 24 hr	Bolus Vol 24 hr	Naloxone Vol 24 hr	Naloxone Attempts 24 hr
	(hour)	(ml)	(ml)	(#)	(ml)	(ml)	(#)
Group I	24.0±9.5	182.6±67.5**	31.6±21.9*****	12.8±10.1*****	0.8±2.0†	11.8±14.0†††	2.5±2.9††† †
Group II	30.0±10.9	227.4±84.3***	57.6±46.1	23.5±21.9	1.3±3.1††	52.2±54.3	10.3±10.9
Group III	30.4±10.8	421.0±111.7	61.4±35.0	28.3±11.6	6.3±6.4	72.5±91.9	16.2±20.1
Group IV	48.0±0.0*	433.4±59.1	64.4±37.7	29.0±18.4	6.3±8.3	70.0±93.9	16.7±26.0

*IV>I,II, & III, p<0.00001; **I<III & IV, p<0.00001; ***II<III & IV, p<0.0001; ****I<III & IV, p<0.02; ***** I<III & IV, p<0.01; † I<III & IV, p<0.03; †† II<III, p<0.02; ††† I<II & III, p<0.03; †††† I<II & III, p<0.05