



A Comparison Of 0.2% Ropivacaine with 0.25% Bupivacaine for Paediatric Lumbar Epidural Block

KEYWORDS

Bupivacaine, Ropivacaine, Epidural, Analgesic

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ABSTRACT Bupivacaine has been a widely used local anaesthetic drug for caudal and lumbar epidural analgesia, but Albright², in 1979, published an alarming editorial which associated the long-acting local anaesthetics – Bupivacaine and Etidocaine with cardiac arrest.

This led to the synthesis of Ropivacaine, a new amino-amide local anaesthetic with less motor block, less cardiotoxicity and the same duration of analgesia in comparison to Bupivacaine.

Our study is an open, randomized double blind prospective study involving a random group of 40 children in the age group of 4 to 12 years scheduled to undergo elective abdominal surgery below the sensory level of T₆.

The children were assigned randomly to one of the two groups. Group B received Bupivacaine 0.25% at 0.7 ml/kg while Group R received Ropivacaine 0.2% at 0.7 ml/kg through the lumbar epidural route.

The present study was designed to compare the hemodynamic changes, duration of analgesia, motor blockade and, to evaluate the factors of efficacy, safety of 0.2% Ropivacaine with 0.25% Bupivacaine administered via lumbar epidural route in combination with light general anaesthesia in children undergoing major abdominal surgery.

Findings (Results):

In this study, the following were the findings in terms of the duration of sensory analgesia and motor blockade.

Mean duration of sensory analgesia was as follows:

- For Bupivacaine - 352.95 ± 23.46 min
- For Ropivacaine - 346.55 ± 22.62 min

This was statistically, Not Significant.

Duration of motor blockade was as follows:

- For Bupivacaine - 181.45 min ± 16.285 min
- For Ropivacaine - 132.05 min ± 09.757 min

This is statistically Significant.

This serves to conclude that Ropivacaine has a comparable duration of sensory analgesia to Bupivacaine with a significantly shorter duration of motor blockade and no significant hemodynamic changes.

INTRODUCTION:

THE SUBJECTIVE NATURE OF PAIN MAKES IT DIFFICULT TO EVALUATE IN A YOUNG CHILD WHO HAS NEITHER A MASTERY OF LANGUAGE NOR HAS PERSONAL REFERENCES UPON WHICH TO DRAW ELEMENTS OF COMPARISON.

THEREFORE THE ROUTINE PRACTICE OF ADMINISTERING OPIOIDS TO ALLEVIATE THE PAIN IN THE INTRA-OPERATIVE AND POST-OPERATIVE PERIOD IN PAEDIATRIC AGE GROUP MAY EITHER BE INSUFFICIENT DUE TO FEAR OF RESPIRATORY DEPRESSION OR MAY EXCEED THE NEEDED DOSE DUE TO DIFFICULTY IN THE INTERPRETATION OF PAIN IN THIS AGE GROUP.

LUMBAR EPIDURAL ANALGESIA IN CHILDREN HAS BECOME POPULAR WITH THE INTRODUCTION OF SMALL-GAUGE EPIDURAL NEEDLE (19G, 20G) ALONG WITH FINE EPIDURAL CATHETERS (23G, 24G) WHICH PASS THROUGH THEM, THEREBY MAKING EPIDURAL ANALGESIA FEASIBLE IN THE SMALLEST OF CHILDREN INCLUDING PREMATURE NEONATES.

LUMBAR EPIDURAL ANALGESIA ALSO PERMITS LIGHT GENERAL ANAESTHESIA, MINIMAL OPIOID USE, EARLY EXTUBATION AND AVOIDANCE OF POST-OPERATIVE VENTILATION, WITH THE ADDED ADVANTAGE OF POST-OPERATIVE ANALGESIA.

THIS PRESENT STUDY IS DESIGNED TO COMPARE THE HEMODYNAMIC CHANGES, DURATION OF ANALGESIA AND MOTOR BLOCKADE, ALONG WITH EVALUATING THE EFFICACY AND SAFETY OF 0.2% ROPIVACAINE WITH 0.25% BUPIVACAINE ADMINISTERED VIA LUMBAR EPIDURAL ROUTE IN COMBINATION WITH LIGHT GENERAL ANAESTHESIA IN CHILDREN UNDERGOING MAJOR ABDOMINAL SURGERY.

MATERIALS AND METHODS:

THE STUDY WAS AN OPEN, RANDOMIZED, DOUBLE-BLIND PROSPECTIVE STUDY. FORTY CHILDREN AGED BETWEEN 4 AND 12 YEARS, WEIGHING 10-25 KG, ASA GRADES I AND II, UNDERGOING ELECTIVE ABDOMINAL SURGERY WERE INCLUDED IN THIS STUDY.

APPROVAL FROM THE HOSPITAL ETHICAL COMMITTEE AND CONSENT FROM THE PARENTS WERE DULY OBTAINED.

ALL THE CHILDREN WERE PREMEDICATED WITH INJ. GLYCOPYRROLATE 10 MG/KG AND INJ. MIDAZOLAM 70 MG/KG IM, 45 MINUTES BEFORE SURGERY; WITH CONTINUOUS MONITORING.

THE CHILDREN WERE RANDOMLY ALLOCATED INTO 2 GROUPS OF 20 EACH.

GROUP B: RECEIVED BUPIVACAINE 0.25% AT 0.7 ML/KG THROUGH THE LUMBAR EPIDURAL ROUTE.

GROUP R: RECEIVED ROPIVACAINE 0.2% AT 0.7 ML/KG THROUGH THE LUMBAR EPIDURAL ROUTE.

THE HEART-RATE, BLOOD PRESSURE, OXYGEN SATURATION WERE RECORDED AT THE FOLLOWING TIME INTERVALS:- BEFORE INDUCTION

- 5 MINUTES BEFORE LUMBAR EPIDURAL ANALGESIA ADMINISTRATION
- 5, 10, 15, 20 MINUTES AFTER EPIDURAL ADMINISTRATION OF LOCAL ANAESTHETIC
- AT THE TIME OF SKIN INCISION
- 5, 10, 15, 30, 60, 90, 120, 150 MINUTES AFTER SKIN INCISION
- 5 MINUTES AFTER EXTUBATION.

-THE PATIENT WAS TRANSFERRED TO THE OPERATING ROOM AND MONITORS CONNECTED. INTRAVENOUS CANNULATION WITH 22G VENFLON I.V. CANNULA WAS DONE AND RINGER LACTATE 10 ML/KG/HR WAS STARTED.

ALL CHILDREN WERE PREOXYGENATED WITH 100% OXYGEN AND INDUCED WITH INJ. THIOPENTONE SODIUM 5 MG/KG I.V. AND INJ. VECURONIUM 0.1 MG/KG I.V. INTUBATION WAS DONE WITH APPROPRIATE ENDOTRACHEAL TUBE.

ANAESTHESIA WAS MAINTAINED WITH NITROUS OXIDE (50%), OXYGEN (50%) AND HALOTHANE (0.2 TO 0.4%).

A LUMBAR EPIDURAL BLOCK AT L1-L2 LEVEL WAS THEN PERFORMED (MID-LINE APPROACH IN THE RIGHT LATERAL DECUBITUS POSITION) WITH A TUOHY NEEDLE (20G) AFTER INFILTRATING THE SKIN AND SUBCUTANEOUS TISSUE WITH 0.5 TO 1 ML OF 1% LIGNOCAINE USING 26G NEEDLE.

THE EXTRADURAL SPACE WAS IDENTIFIED WITH A LOSS OF RESISTANCE TO AIR. A TEST DOSE OF 1 ML. OF EITHER 0.25% BUPIVACAINE OR 0.2% ROPIVACAINE WITH ADRENALINE 1 IN 200,000 RATIO WAS INJECTED AFTER NEGATIVE ASPIRATION FOR CSF OR BLOOD THROUGH THE TUOHY NEEDLE.

THE TOTAL CALCULATED DOSE OF LOCAL ANAESTHETIC SOLUTION WAS THEN INJECTED 3 MINUTES AFTER THE TEST DOSE IF THERE WAS NO SIGNIFICANT CHANGE IN THE HEART RATE OR BLOOD PRESSURE.

A DURATION OF 20 MINUTES WAS ALLOWED FROM THE ADMINISTRATION OF LOCAL ANAESTHETIC TO THE SKIN INCISION FOR THE SAKE OF UNIFORMITY AND CONFIRMATION OF SENSORY ANALGESIA

(DALENS' PIN-PRICK METHOD1).

PATIENTS WERE OBSERVED SPECIFICALLY FOR THE ADVERSE EFFECTS OF BUPIVACAINE / ROPIVACAINE I.E. HYPOTENSION, BRADYCARDIA.

AT THE END OF SURGERY, INJ. NEOSTIGMINE (50 MG/KG) I.V. AND INJ. GLYCOPYRROLATE (10 MG/KG) I.V. WERE USED FOR REVERSAL AND PATIENT EXTUBATED AFTER RECOVERY OF REFLEXES.

POST-OPERATIVELY, OXYGEN SATURATION, CONTINUOUS HEART RATE MONITORING WERE DONE AND BLOOD PRESSURE RECORDED EVERY 10 MINUTES FOR AN HOUR.

THE PATIENTS WERE THEN CONTINUOUSLY MONITORED FOR THE NEXT 6 HOURS. NAUSEA, VOMITING, URINE RETENTION, PRURITUS AND ANY OTHER SIDE EFFECTS UP TO 6 HOURS WERE NOTED DURING THE POST-OPERATIVE PERIOD.

ASSESSMENT OF SENSORY ANALGESIA:

RECOVERY WAS ASSESSED AS PER THE PAEDIATRIC OBJECTIVE PAIN SCORE (OPS) – **TABLE 1**.

IF THE SCORE WAS 6 OR MORE, RESCUE ANALGESIC INJ. PARACETAMOL OR INJ. PENTAZOCINE 0.5 MG/KG IM WAS GIVEN.

THE DURATION OF SENSORY ANALGESIA IS CALCULATED FROM THE TIME OF ADMINISTRATION OF LOCAL ANAESTHETIC TILL THE TIME FOR RESCUE ANALGESIA IS SOUGHT.

ASSESSMENT OF MOTOR BLOCKADE:

AFTER COMPLETE RECOVERY, MOTOR BLOCKADE WAS ASSESSED AS PER MODIFIED BROMAGE9 SCALE. THE SAME WAS REPEATED EVERY 15 MINUTES TILL THE SCORE OF ZERO WAS OBTAINED.

THE DURATION OF MOTOR BLOCKADE IS CALCULATED AS FROM THE TIME OF ADMINISTRATION OF LOCAL ANAESTHETIC EPIDURALLY TILL A SCORE OF ZERO IS OBTAINED. – **TABLE 2**.

RESULTS:

ALL THE DATA COLLECTED WERE TABULATED IN TERMS OF MEAN AND STANDARD DEVIATION. THE DATA WERE COMPARED BETWEEN THE GROUPS IN THE FOLLOWING MANNER:

AGE, WEIGHT, DURATION OF SURGERY, HEMODYNAMIC PARAMETERS, ONSET AND DURATION OF SENSORY AND MOTOR BLOCKADE AND DURATION OF ANALGESIA WERE COMPARED USING STUDENT'S UNPAIRED 'T' TEST.

FISCHER EXACT TEST WAS APPLIED FOR ASSESSMENT OF QUALITY OF BLOCK. P- VALUE WAS CONSIDERED SIGNIFICANT IF IT WAS LESS THAN 0.05.

THE CHANGES IN THE HEART RATE AND MEAN ARTERIAL PRESSURE AT VARIOUS INTERVALS AFTER THE ADMINISTRATION OF THE EPIDURAL ANAESTHETICS IN BOTH THE GROUPS WERE COMPARED AND FOUND TO BE STATISTICALLY INSIGNIFICANT.

HOWEVER THERE IS A HIGHER PERCENTAGE OF DECREASE IN THE HEART RATE IN PATIENTS THAT WERE GIVEN BUPIVACAINE (-43.950%, SD - 5.888) THAN ROPIVACAINE (-34.150%, SD - 13.327) WHICH IS STATISTICALLY SIGNIFICANT (P VALUE < 0.0046; **TABLE - 8**)

FURTHER, THE PERCENTAGE OF FALL IN BLOOD PRESSURE IS HIGHER IN THE BUPIVACAINE THAN IN THE ROPIVACAINE GROUP (P VALUE < 0.0419; **TABLE – 9**)

THE DURATION OF MOTOR BLOCKADE BY BUPIVACAINE WAS SIGNIFICANTLY LONGER THAN THAT PRODUCED BY ROPIVACAINE.

COMPLICATIONS:

INCIDENTS OF URINE RETENTION WAS SEEN IN TWO CHILDREN IN THE BUPIVACAINE GROUP. NO OTHER COMPLICATIONS SUCH AS PRURITUS, HYPOTENSION, OR VOMITING WAS NOTED IN EITHER OF THE GROUPS.

RESULT: IN OUR STUDY, THE MEAN DURATION OF SENSORY ANALGESIA WAS 352.95 ± 23.46 MIN. WITH BUPIVACAINE AND 346.55 ± 22.62 MIN FOR ROPIVACAINE WHICH WAS STATISTICALLY NOT SIGNIFICANT.

THE DURATION OF MOTOR BLOCKADE IS 181.45 MIN \pm 16.285 MIN FOR BUPIVACAINE AND 132.05 MIN \pm 9.757 MIN FOR ROPIVACAINE. THIS IS STATISTICALLY SIGNIFICANT.

ROPIVACAINE HAS A COMPARABLE DURATION OF SENSORY ANALGESIA TO BUPIVACAINE WITH A SIGNIFICANTLY SHORTER DURATION OF MOTOR BLOCKADE AND NO SIGNIFICANT HEMODYNAMIC CHANGES. TABLE - 12

DISCUSSION:

IN CHILDREN, LUMBAR EPIDURAL ANAESTHESIA IN COMBINATION WITH GENERAL ANAESTHESIA FOR ABDOMINAL SURGERIES IS OF INTEREST SINCE IT DECREASES THE REQUIREMENT FOR SYSTEMIC ANALGESICS AND NEURO-MUSCULAR BLOCKING DRUGS AND CAN ALSO PROVIDE EFFECTIVE POST-OPERATIVE ANALGESIA.

N.S. MORTON⁶, MCCLURE⁵, G. IVANI^{3,7}, M. J. CONCEICAO⁸ ALSO COMPARED 0.2% ROPIVACAINE TO 0.25% BUPIVACAINE AND BASED ON THEIR STUDY, IT WAS PROVED THAT 0.2% ROPIVACAINE IS COMPARABLE TO 0.25% BUPIVACAINE. WHEN THE SAME MASS OF ROPIVACAINE IS GIVEN IN A LARGER VOLUME THAN BUPIVACAINE, ANALGESIA IS PROLONGED. WHEN A LARGER MASS OF ROPIVACAINE IS GIVEN IN A SMALLER VOLUME ALSO, THE ANALGESIA IS PROLONGED.

G. IVANI^{3,7} HAS COMPARED 0.1% AND 0.2% ROPIVACAINE AND CONCLUDED THAT 0.1% IS INSUFFICIENT TO PROVIDE INTRAOPERATIVE ANALGESIA.

I. MURAT ET AL¹⁰ HAVE USED ROPIVACAINE AT 0.75 ML/KG FOR CHILDREN LESS THAN 20 KG AT THE L1-L2 INTERSPACE AND CONCLUDED THAT IT PROVIDES ADEQUATE SENSORY ANALGESIA TILL T6 LEVEL. THE SAME HAS BEEN PROVED IN THIS PRESENT STUDY AS WELL.

CONSIDERING THE WEAK RESISTANCE OF LIGAMENTUM FLAVUM IN CHILDREN THAN IN ADULTS AND FOR GREATER COMPLIANCE OF THE EXTRADURAL SPACE, MURAT ET AL RECOMMENDED USE OF GRADUATED NEEDLE WITH SHORT BEVELED EDGE AND SMALL VOLUME SYRINGES (LOSS OF RESISTANCE TECHNIQUE).

THE ONSET OF SENSORY ANALGESIA WAS ACCORDING TO THE METHOD OF DALENS¹ PIN-PRICK METHOD. THE ONSET TIME WAS 13.1 MIN FOR BUPIVACAINE AND 11.7 MIN FOR ROPIVACAINE ACCORDING TO

G. IVANI ET AL., WHEREAS IT WAS 12 MIN FOR BUPIVACAINE AND 9 MIN FOR ROPIVACAINE ACCORDING TO MC GLADE ET AL⁴. HENCE IN OUR STUDY, WE FIXED A DURATION OF 15 MIN FROM THE TIME OF EPIDURAL INJECTION TO TEST SENSORY BLOCKADE.

G. IVANI ET AL³ IN THEIR STUDY HAVE REPORTED A DURATION OF SENSORY ANALGESIA OF 471 MIN FOR BUPIVACAINE AND 506 MIN FOR ROPIVACAINE. THE AGE OF THE STUDY GROUP WAS 2 – 12 MONTHS WHICH MAY BE THE REASON FOR PROLONGED ANALGESIA.

MODIFIED BROMAGE SCALE WAS USED IN THIS STUDY TO MONITOR THE MOTOR BLOCKADE IN THE POST-OPERATIVE PERIOD. MCCLURE HAD REPORTED THAT MODIFIED BROMAGE SCALE IS SIMPLE TO APPLY IN THE CLINICAL SETTING.

IN OUR STUDY, THE DURATION OF MOTOR BLOCKADE IS 181.45 MIN \pm 16.285 MIN FOR BUPIVACAINE AND 132.05 MIN \pm 9.757 MIN FOR ROPIVACAINE. THE DIFFERENCE IS STATISTICALLY SIGNIFICANT AND IN ACCORDANCE WITH THE STUDIES OF G. IVANI ET AL⁷, MCCLURE ET AL⁵, M.K. DA CONCEICAO ET AL⁸.

ROPIVACAINE PRODUCES SHORT, LESS-INTENSE MOTOR BLOCKADE. IT BLOCKS THE C-FIBRES FASTER THAN THE A-FIBRES AND WAS A POTENT PRODUCER OF FREQUENCY-DEPENDENT BLOCK WHICH IS RELATED TO THE LIPID SOLUBILITY AND MOLECULAR WEIGHT OF THE LOCAL ANAESTHETIC DRUG.

THE LOWER LIPID SOLUBILITY OF ROPIVACAINE IS PRESUMED TO RETARD PENETRATION OF THE MYELIN SHEATH. THE SMALLER DIAMETER OF THE NERVE ROOTS, POOR MYELINATION AND THE GELATINOUS SPONGY APPEARANCE WITH DISTINCT SPACES BETWEEN THE FAT LOBULES IN THE EPIDURAL SPACE, EXPLAINS THE SUCCESS IN EPIDURAL BLOCKADE IN YOUNG CHILDREN.

TABLES:

SL. NO.	PARAMETER	OBSERVATION	POP SCORE
1	BLOOD PRESSURE (SYS.)	>10 % OF PRE-OP	0
		>20 % OF PRE-OP	1
		>30 % OF PRE-OP	2
2	CRYING	NOT CRYING	0
		CRYING, BUT RESPONDS TO TENDER LOVING CARE (TLC)	1
		CRYING, BUT NO RESPONSE TO TLC	2
3	MOVEMENT	NONE	0
		RESTLESS	1
		THRASHING	2
4	AGITATION	ASLEEP / CALM	0
		MILD AGITATION	1
		HYSTERICAL	2
5	VERBAL EVALUATION OF BODY LANGUAGE	ASLEEP OR STATE OF NO PAIN	0

	FLEXING EXTREMITIES (PRE-VERBAL CHILD)	1
	MODERATE PAIN – CAN LOCALIZE	2

TABLE 1: PAEDIATRIC OBJECTIVE PAIN SCORE (HANNALLAH ET AL)

BROMAGE SCORE	OBSERVATION
0	NO MOTOR BLOCK, CHILD MOVES LIMBS FREELY
1	INABILITY TO RAISE THE LEGS
2	INABILITY TO FLEX THE KNEES
3	NO MOVEMENT POSSIBLE ON THE LEGS

TABLE 2: MODIFIED BROMAGE SCALE

SL. NO.	VARIABLES	BUPIVACAINE	ROPIVACAINE	T-VALUE / CHI-SQUARE	STATISTICAL SIGNIFICANCE / P-VALUE
1	AGE MEAN	5.70 ± 1.81	6.65 ± 1.87	1.63	0.1109
2	SEX RATIO	13:7	12:8	0.11	0.7439
3	WEIGHT IN KG	15.40 ± 2.93	16.55 ± 3.10	1.20	0.2354
4	MEAN DURATION OF SURGERY	97.45 ± 27.45	84.55 ± 29.08	1.44	0.1573

TABLE 3: DETAILS OF PATIENTS AND DURATION OF SURGERY

PARAMETER	BEFORE INDUCTION	5 MIN. BEFORE EPIDURAL	TIME AFTER EPIDURAL INJECTION			
			5 MIN	10 MIN	15 MIN	20 MIN
HEART RATE						
MEAN ± SD (BEATS/MIN)	118.90 ± 8.81	118.40 ± 8.25	116.95 ± 7.76	115.65 ± 6.99	113.86 ± 6.99	111.40 ± 8.09
MEAN BLOOD PRESSURE						
MEAN ± SD (MM HG)	69.50 ± 4.10	68.70 ± 4.16	67.95 ± 3.65	66.80 ± 3.65	66.2 ± 3.74	64.60 ± 3.68

TABLE 4: HEMODYNAMIC CHANGES WITH BUPIVACAINE:

PARAMETER	AT SKIN INCISION	TIME AFTER SKIN INCISION				AFTER EXTUBATION
		5 MIN	10 MIN	15 MIN	20 MIN	
HEART RATE						
MEAN ± SD (BEATS/MIN)	114.75 ± 8.09	113.10 ± 8.66	110.75 ± 8.00	109.85 ± 8.34	102.60 ± 8.51	111.40 ± 6.92
MEAN BLOOD PRESSURE						
MEAN ± SD (MM HG)	65.85 ± 3.41	64.50 ± 3.561	62.90 ± 3.32	62.75 ± 3.32	62.05 ± 2.78	64.45 ± 2.44

TABLE 5: CHANGES AFTER ADMINISTRATION OF THE DRUG EPIDURALLY (BUPIVACAINE):

PARAMETER	BEFORE INDUCTION	5 MIN. BEFORE EPIDURAL	TIME AFTER EPIDURAL INJECTION			
			5 MIN	10 MIN	15 MIN	20 MIN
HEART RATE						
MEAN ± SD (BEATS/MIN)	111.45 ± 14.88	114.25 ± 9.18	113.70 ± 9.95	112.05 ± 8.76	109.55 ± 9.62	108.30 ± 9.51
MEAN BLOOD PRESSURE						
MEAN ± SD (MM HG)	76.35 ± 9.07	74.95 ± 9.35	75.45 ± 8.99	74.80 ± 10.01	75.05 ± 9.21	73.55 ± 9.81

TABLE 6: HEMODYNAMIC CHANGES WITH ROPIVACAINE

PARAMETER	AT SKIN INCISION	TIME AFTER SKIN INCISION				AFTER EXTUBATION
		5 MIN	10 MIN	15 MIN	20 MIN	
HEART RATE						
MEAN ± SD (BEATS/MIN)	108.50 ± 9.68	106.65 ± 9.62	104.60 ± 9.91	103.50 ± 9.61	108.50 ± 7.78	108.22 ± 9.21
MEAN BLOOD PRESSURE						
MEAN ± SD (MM HG)	73.55 ± 9.81	74.25 ± 9.36	72.90 ± 9.43	72.40 ± 9.77	71.45 ± 9.13	74.33 ± 8.09

TABLE 7: CHANGES AFTER ADMINISTRATION OF THE DRUG EPIDURALLY (ROPIVACAINE)

TIME (IN MINUTES)	DRUG	HEART RATE		BLOOD PRESSURE	
		MEAN (SD)	T VALUE (P VALUE)	MEAN (SD)	T VALUE (P VALUE)
5	BUPIVACAINE	-1.300 (1.380)	1.1301 (0.2655)	-1.000 (1.747)	2.9497 (0.0054)
	ROPIVACAINE	-0.400 (3.283)		0.750 (1.997)	
10	BUPIVACAINE	-2.450 (1.701)	0.9677 (0.3393)	-2.850 (1.725)	1.9097 (0.0037)
	ROPIVACAINE	-1.900 (1.889)		-0.200 (5.961)	
15	BUPIVACAINE	-3.750 (1.618)	0.5537 (0.5830)	-3.600 (2.583)	2.3403 (0.0246)
	ROPIVACAINE	-4.150 (2.796)		0.300 (6.989)	
20	BUPIVACAINE	-5.850 (2.758)	0.7392 (0.4642)	-6.000 (2.902)	2.3549 (0.0238)
	ROPIVACAINE	-5.200 (2.802)		-1.750 (7.532)	
25	BUPIVACAINE	-43.950 (5.889)	3.0079 (0.0046)	-4.150 (3.014)	1.9489 (0.0587)
	ROPIVACAINE	-34.150 (13.327)		-0.700 (7.320)	

TABLE 8: RATE OF CHANGE IN HEMODYNAMICS AFTER EPIDURAL INJECTION

TIME (IN MINUTES)	DRUG	HEART RATE		BLOOD PRESSURE	
		MEAN (SD)	T VALUE (P VALUE)	MEAN (SD)	T VALUE (P VALUE)
5	BUPIVACAINE	-4.550 (3.252)	1.9097 (0.0637)	-6.050 (3.220)	2.1057 (0.0419)
	ROPIVACAINE	-6.650 (3.689)		-2.150 (7.631)	
10	BUPIVACAINE	-6.400 (2.963)	1.7408 (0.0898)	-8.450 (3.517)	3.1017 (0.0036)
	ROPIVACAINE	-8.400 (4.198)		-2.600 (7.667)	
15	BUPIVACAINE	-7.250 (3.432)	1.6234 (0.1128)	-8.500 (3.317)	2.4625 (0.0184)
	ROPIVACAINE	-9.300 (4.485)		-3.200 (9.036)	
30	BUPIVACAINE	-8.650 (3.602)	1.3443 (0.1868)	-9.500 (4.224)	2.4596 (0.0186)
	ROPIVACAINE	-10.150 (3.453)		-4.450 (8.153)	

AFTER EXTUBATION	BUPIVACAINE	-5.950 (3.762)	1.1415 (0.2612)	-6.050 (5.246)	2.2958 (0.0276)
	ROPIVACAINE	-4.722 (2.718)		-0.556 (9.173)	

TABLE 9: RATE OF CHANGE IN HEMODYNAMICS AFTER SKIN INCISION

SL. NO.	PARAMETER	BUPIVACAINE		ROPIVACAINE		P - VALUE P = 0.05	T-VALUE
		MEAN	SD	MEAN	SD		
1	SENSORY ANALGESIA	352.95	± 23.46	346.55	± 22.619	0.8782	
2	MOTOR BLOCKADE	181.45	± 16.285	132.05	± 9.757	0.000	10.93

TABLE 10: DURATION (IN MINUTES) OF ACTION OF EPIDURAL ANAESTHETICS

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