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Hemodynamic Stress Responses to Skull Pin Insertion Following Scalp Block With 0.5% Bupivacaine V/S 0.5% Ropivcaine in Patients Undergoing Craniotomy for Intracranial Tumours: A Comparative Study

Anaesthesiology

KEYWORDS : Bupivacaine, Ropivacaine, Anova, Tukey Kramer methods.

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ABSTRACT

BACKGROUND AND AIMS: *To study and compare the hemodynamic stress response to skull pin insertion following scalp block with 0.5% bupivacaine v/s 0.5% ropivacaine in patients undergoing craniotomy for intracranial tumours.*

MATERIALS AND METHODS:*The study was done in patients of age between 18 to 60 years of ASA-I and II status of both sexes presenting for elective craniotomy for intracranial tumours.The patients were assigned to two groups of 25 patients each*
Group-I patients: Received 20 ml 0.5% bupivacaine (100mg).Group-II patients: Received 20 ml of 0.5% ropivacaine (100mg).

RESULTS*: The observed hemodynamic variables such as heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and spo2 at various time intervals in both the groups showed a statistically significant ($p<0.05$) difference in anova and tukey Kramer method of statistical analysis.*

CONCLUSION*: As both 0.5% bupivacaine and 0.5% ropivacaine, when used in scalp block to attenuate the stress response to skull pin placement in craniotomy patients showed statistically significant $p<0.05$% and has no superiority of either of the drug in attenuating the hemodynamic stress response to skull pin placement over each other, 0.5% ropivacaine is preferable instead of 0.5% bupivacaine in view of its better cardio stability over bupivacaine.*

INTRODUCTION:

Neurosurgical procedures often require stabilisation of the head and neck by applying the skull pin head holder or the Mayfield pin head holder.

The application of these instruments produces an intense nociceptive stimulus and results in abrupt increase in blood pressure and cerebral blood flow under general anaesthesia (1).

This abrupt increase in blood pressure and subsequent increase in intracranial pressure may lead to cerebral oedema and cell damage (2).

A wide range of techniques have been tried earlier to attenuate this hemodynamic response, which include skin infiltration with local anaesthetic agents, deepening the level of anaesthesia with volatile agents, intravenous opiods and antihypertensives etc.

All these methods have shown variable success and mixed results so far(3-11).

Neural blockade of the scalp has a history that extends over several eras of anaesthetic neurosurgical practice. It was first used to permit intracranial procedures when general anaesthesia for these surgeries had not yet advanced sufficiently to be considered safe, later to permit functional mapping during surgery without interference from general anaesthesia and most recently as an adjunct to general anaesthesia to maintain hemodynamic control (12).

A scalp block involves regional anaesthesia to the nerves that innervate the scalp providing analgesia for a considerable period of time with the potential for post-operative effect.

Blocking noxious input to the abundant sensory nerve supply of the scalp thus prevents the hemodynamic response to head pin application (13).

The criteria for selection of the optimal local anaesthetic and its concentration for scalp block to reduce the stress response to noxious stimulus must include its availability, time of onset, duration of blockade and side effects of each drug and dose.

A drug that has a faster onset, longer duration of action and minimum toxicity profile is thus preferred

The most commonly used local anaesthetic for scalp block are bupivacaine and ropivacaine.

Ropivacaine is a long acting amide local anaesthesia with a potentially improved safety profile in terms of improved cardiac stability when compared to bupivacaine (14).

Very few clinical studies, which compare bupivacaine and ropivacaine for their efficacy to attenuate the hemodynamic response to skull pin application, have been reported in the available literature so far.

The aim of our study was to compare the use of equipotent doses of 0.5% bupivacaine and 0.5% ropivacaine for scalp block and to study their effect on hemodynamic responses to skull pin insertion.

MATERIALS, METHODS AND STATISTICS:
A prospective randomized double blind comparative study was conducted after institution ethics committee approval in 50 patients of age between 18 to 60 yrs. of ASA-I and II status of both sexes presenting for elective craniotomy, for intracranial tumours after obtaining informed consent of every patient and their relatives.

SAMPLE SIZE ESTIMATION:
Sample size was estimated by using pass software version 13 obtaining data from previous study of Dawlatly (34) for Anova repeated measures taking the mean arterial pressure measurement at different time intervals in the following manner.

Between the group levels (categories) B1=2

Means of MAP= 85 and 82 from previous study within level W1= 10

Means of MAP= 85, 82, 94,95,93,92,88,86,87, and 85.

SAMPLING PROCEDURE:
The patients were assigned to one of the following two groups by Efron's biased coin randomization algorithm by using pass software.

Group-I: consisted of 25 patients who received 20ml of 0.5% bupivacaine at the time of skull pin placement.

Group-II: consisted of 25 patients who received 20ml 0.5% ropivacaine at the time of skull pin placement.

PROCEDURE:
A day prior to the surgery preoperative visit was made and a detailed history and clinical examination of the patient was done

All patients were kept nil per oral (NPO) for 6 hours prior to the surgery.

In the operation theatre, after connecting the patient to standard monitoring including ECG,Spo_2 and NIBP, intravenous access was secured using 2 large bore 16G iv cannulas and radial artery cannulated with 20G arterial switch cannula for invasive arterial blood pressure monitoring.

Central line was secured through subclavian vein approach (after general anaesthesia and securing airway) for central venous pressure monitoring.

Premedication given with injection glycopyrolate 0.1mg and fentanyl 2μ/kg intravenously prior to induction.

Induction was done with intravenous thiopentone 4mg/kg titrated to loss of eyelash reflex.

After induction, patients were ventilated with (60:40) air and O2 mixture and intravenous bolus dose of Inj: atracurium 0.6mg/kg was given for achieving adequate muscle relaxation for intubation with appropriate size of endotracheal tube.

Anaesthesia maintained with air, oxygen mixture (60:40), 1% isoflurane and infusion of atracurium and fentanyl with syringe pump.

Scalp block was then performed bilaterally under sterile precautions as described by pinosky et al with 20 ml of 0.5% bupivacaine in the group I and 20ml of 0.5% ropivacaine in group-II.

The supra-orbital and supratrochlear nerves were blocked with 2ml of either of drug as they emerged from the orbit with 23G needle introduced above the eyebrow perpendicular to the skin.

The zygomatico-temporal nerves were blocked with 2ml on each side from the lateral edge of the supraorbital rim in a direction pointing cephalad towards the temporalis muscle in both the superficial and deep plane

The auriculo-temporal nerves were blocked bilaterally with 2ml of solution injected 1.5cm anterior to the ear at the level of the tragus.

The post auricular branches of the greater auricular nerves were blocked with 2ml of solution between skin and bone, 1.5cm posterior to the ear at the level of the tragus.

The greater, lesser and third occipital nerves were blocked with 2ml of solution using a 23G spinal needle with infiltration along superior nuchal line, approximately halfway between occipital protuberance and the mastoid process.

Monitoring of heart rate, invasive blood pressure which included systolic, diastolic and mean arterial pressures and spo2 was done throughout the study and recorded at the following time intervals→ pre induction(baseline), pre block, during block, before pin application, ,during pin application, after pin application at 1min,3min,5min,and 8 minutes.

End tidal carbon dioxide (etco2) was recorded before and during surgery and was maintained throughout at 30-35 mmHg.

Residual neuromuscular blockade was antagonised using neostigmine 0.04mg/kg and atropine 0.02mg/kg at the end of surgery.

When the patient had adequate respiratory efforts and responded to verbal commands, extubation was done and patient shifted to ICU for further monitoring and observation for any side effects and complications.

DATA RECORDING:
All the data was collected, tabulated and the statistical analysis was carried out using NCSS 9 version 9.0.8 statistical software.

Continuous data were represented as mean (SD), categorical data as frequency and percentages.

The pre-requisite assumption for student "t" test and ANOVA like normality of distribution of data was assessed graphically and by Anderson-Darling test for all the parameters.

An example is shown in table 1 for the parameter mean arterial pressure (MAP).

Imbalance of baseline parameters, was assessed by chi-square test and observing the mean values in the two groups.

TABLE 1:

Group variable name	Anderson darling test value	p-value	Decision(5%)
Group-I MAP	0.54	0.39	Cant reject normality

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Group-II MAP	0.47	0.25	Cant reject normality

RESULTS:
A total of 50 patients, who underwent craniotomy for intracranial tumours had been studied. The data was collected, tabulated, analysed and the following observations were made.

Demographic data:
Demographic data was analysed, by using two sample't' test and gender of the patients by Chi-

Square test. The two groups were comparable in terms of data as there were no significant differences in terms of age, weight, and sex (Table 2).

Table 2. Demographic Parameters [Mean (SD)]:

PARAMETER	GROUP I	GROUP II	P VALUE
AGE (YEARS) MEAN (SD)	40.56 (12.87)	37.44 (11.22)	0.365
WEIGHT(KGS) MEAN (SD)	62.6 (9.79)	63.28 (6.45)	0.773
SEX MALE: FEMALE	10:15	14 : 11	0.257

The type of intracranial tumours are shown in following table 3✱

TYPE OF TUMOUR	GROUP I	GROUP II
MENINGIOMA	12 (48 %)	7 (28%)
GLIOMA	9 (38%)	9 (36%)
ASTROCYTOMA	0	3 (12%)
SCHWANNOMA	2 (8%)	4 (16%)
HEMANGIOPERICYTOMA	0	1 (4%)
HEMANGIOMA	1 (4%)	1(4%)
HEMANGIOBLASTOMA	1(4%)	0

Intra-group comparisons:
All the observed hemodynamic variables such as heart rate (HR), Systolic Blood Pressure(SBP),Diastolic Blood Pressure(DBP) and Mean Arterial Blood Pressure(MAP) were recorded at various time points : Pre-induction (PI),Pre-block (PB),During block (DB),Before pin placement (BP), During pin placement (DP), 1 minute,3 minutes,5 minutes,8 minutes after pin placement. When compared within the group at different time intervals ,both in group I & II using repeated measures of ANOVA a statistically significant ($p<0.05$) difference was observed

Later Tukey Kramer multiple comparison tests were done within the groups.

Table 4: Results of Repeated measures of ANOVA within the groups (I & II):

Parameters	Degrees of Freedom (df)	Sum of Squares	Mean square	F- Value	P Value
SBP	8	33801.84	4225.23	45.35	0.000*
DBP	8	9683.871	1210.484	26.00	0.000*
MAP	8	12351.64	1543.956	27.43	0.000*
HR	8	9842.671	1230.334	28.31	0.000*
$SP0_2$	8	81.644	10.205	90.34	0.000*

Systolic Blood Pressure (SBP):

The SBP on comparison with Tukey Kramer test within the groups was found to be statistically significant ($p <0.05$) from the baseline value at time of giving the block (8.79 %), at pin placement (9.10%) and at 8 minutes (12.93%) in group I. (Table 5) whereas in group II significant ($p <0.05$) change observed during the block at 5 minutes and 8 minutes after the pin placement. (Table 6).

Table 5. Intra group comparison of SBP at different time intervals using Tukey-Kramer test in Group I (0.5%Bupivacaine) -Baseline to different time intervals.

Time Intervals	Group I Mean (SD)	Mean Difference (PI-various time inervals)	Percentage change from Basal	P value
PI (Baseline)	134.24 (15.49)			
PI (Baseline)	138.76(16.93)	-4.52	3.37	0.975
DB (During block)	146.04(14.01)	-11.8	8.79	0.002*
BP (Before pin)	131.4(17.62)	2.84	2.12	0.999
DP (During pin)	146.44(18.97)	-12.2	9.10	0.000*
1 min	139.08(16.58)	-4.84	3.60	0.953
3 min	132.88(18.22)	1.36	1.00	1.00
5 min	125.8(13.10)	8.44	6.29	0.168
8 min	116.88(11.78)	17.36	12.93	0.000*

*p value showing significance.

Table 6: Intra group comparison of SBP at different time interval using Tukey – Kramer test in group II 0.5% Ropivacaine-baseline to different time intervals.

Time Intervals	Group II Mean (SD)	Mean Difference (PI– various time intervals)	Percentage Change from Basal	P value
PII (Baseline)	131.44 (9.68)			
PB (Pre block)	132.32 (7.51)	-0.88	0.67	1.000
DB (During block)	146.56 (10.33)	-15.12	11.50	0.000*
BP (Before pin)	130.2 (8.25)	1.24	0.94	1.000
DP (During pin)	135.48 (10.27)	-4.04	3.08	0.992
1 min	127.72(7.79)	3.72	2.83	0.997
3 min	122.04(7.98)	9.4	7.15	0.062
5 min	118.92(7.80)	12.54	9.54	0.000*
8 min	114.76(6.58)	16.68	12.69	0.000*

*p value showing significance.

DIASTOLIC BLOOD PRESSURE (DBP):
The DBP on comparison with Tukey Kramer test within the group was found to be statistically significant ($p <0.05$) from the baseline value during block and pin placement in group I(Table 7), where as in group II only during the block (Table 8).

Table 7: Intragroup comparison of DBP at different time intervals using Tukey – Kramer test in group I (0.5% Bupivacaine)- Baseline to different time intervals.

Time Intervals	Group I Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PI (Baseline)	78.76(10.69)			
PB (Pre block)	77.72(8.61)	1.04	1.32	1.000
DB (During block)	85.44(14.29)	6.68	8.48	0.046*

BP (Before pin)	78.72(13.76)	0.04	0.05	1.000
DP (During pin)	90.16(13.74)	-11.4	14.47	0.000*
1 min	83.8(10.97)	-5.04	6.34	0.457
3 min	79.52(12.18)	-0.76	1.03	1.000
5 min	74.4(11.17)	4.36	5.53	0.722
8 min	72.2(8.48)	6.56	8.33	0.071

* p value showing significance

Table 8. Intragroup comparison of DBP at different time intervals using Tukey – Kramer test in group II (0.5% Ropivacaine) – Baseline to different time intervals

Time Intervals	Group II Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PI (Baseline)	81.52 (5.08)			
PB (Pre block)	75.96 (3.89)	5.56	6.82	0.274
DB (During block)	89.64(7.82)	8.12	9.92	0.003*
BP (Before pin)	80.12(6.39)	1.4	1.72	0.999
DP (During pin)	83.48(8.01)	1.96	2.40	0.999
1 min	81.76(6.83)	0.24	0.30	1.000
3 min	77.72(4.98)	3.8	4.66	0.888
5 min	76.6(5.45)	4.92	6.03	0.504
8 min	73.64(7.26)	7.88	9.66	0.006*

* p value showing significance

Table 9. Intra group comparison of MAP at different time interval using Tukey – Kramer test in group I (0.5% Bupivacaine) – Baseline to different time intervals

Time Intervals	Group I Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PI (Baseline)	96.92(15.26)			
PB (Pre block)	96.04(9.75)	0.88	0.9	1.000
DB (During block)	107.56(12.88)	-10.64	10.97	0.000*
BP (Before pin)	98.4(16.60)	-1.48	1.53	1.000
DP (During pin)	109.8(17.98)	-12.88	13.3	0.000*
1 min	102.8(15.56)	-5.88	6.06	0.34432
3 min	98.8(16.03)	-1.88	1.94	0.999
5 min	92.96(12.03)	3.96	4.08	0.927
8 min	88.44(10.93)	8.48	8.75	0.008*

* p value showing significance

Table 10: Intra group comparison of MAP at different time intervals using Tukey-Kramer test in group II (0.5% bupivacaine)-baseline to different time intervals.

Time Intervals	Group II Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PII (Baseline)	98.4(4.73)			
PB (Pre block)	93.76(4.41)	4.64	4.71	0.771
DB (During block)	103.24(5.70)	4.84	4.91	0.707
BP (Before pin)	96.72(5.062)	1.68	1.70	0.999
DP (During pin)	100.12(6.97)	1.72	1.74	0.999
1 min	96.96(5.41)	1.44	1.46	1.000
3 min	93.24(92.56)	5.16	5.53	0.595
5 min	91.84(5.68)	6.56	6.67	0.168
8 min	87.76(6.28)	10.64	10.81	0.000*

*p value showing significance.

HEART RATE:

The Heart rate on comparison with Tukey – Kramer test within the groups was found to be statistically significant ($p < 0.05$) from the baseline value during block and pin placement and at 1 minute after pin placement in both the groups (Table 11 & 12).

Table 11. Intragroup comparison of HR at different time intervals using Tukey-Kramer Test in Group I (0.5% Bupivacaine)-Baseline to different time intervals.

Time Intervals	Group I Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PI (Baseline)	73.4(12.15)			
PB (Pre block)	78.2(13.98)	4.8	6.54	0.485
DB (During block)	84.44(18.07)	11.04	15.04	0.000*
BP (Before pin)	79.48(20.36)	6.08	8.28	0.048
DP (During pin)	86.6(21.65)	13.2	17.98	0.000*
1 min	84.36(20.59)	10.96	14.93	0.000*
3 min	79.76(18.65)	6.36	8.66	0.069
5 min	76.52(17.46)	3.12	4.25	0.972
8 min	72.92(17.85)	0.48	0.65	1.000

* p value showing significance

Table 12. Intragroup comparison of HR at different time intervals using Tukey-Kramer test in Group II (0.5% Ropivacaine)-Baseline to different time intervals.

Time Intervals	Group II Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PI (Baseline)	73.68(7.28)			
PB (Preblock)	75.2(8.09)	1.52	2.06	0.999
DB (During block)	89.32 (11.90)	13.64	18.52	0.000*
BP (Before pin)	78.48(9.00)	4.8	6.51	0.485
DP (During pin)	86.24(7.42)	12.56	17.04	0.000*
1 min	81.64(5.98)	7.96	10.80	0.002*
3 min	78.32(7.15)	4.64	6.29	0.551
5 min	78.52(7.51)	4.84	6.56	0.466
8 min	74.28(8.025)	0.6	0.81	1.000

* p value showing significance

SPO_2

The SPO_2 on comparison with Tukey – Kramer test within the groups was found to be statistically significant ($p < 0.05$) at all the time interval in both the groups.(Table 13 & 14).

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Table 13. Intra group comparison of SPO_2 with Tukey – Kramer test in group I (0.5 % bupivacaine) baseline to different time intervals.

Time Intervals	Group I Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PI (Baseline)	99.72(0.79)			
PB (Pre block)	99.24(0.66)	-0.52	0.52	0.000*
DB (During block)	99.68(0.48)	-0.96	0.96	0.000*
BP (Before pin)	99.92(0.28)	-1.2	1.20	0.000*
DP (During pin)	99.92(0.28)	-1.2	1.20	0.000*
1 min	99.96(0.28)	-1.24	1.24	0.000*
3 min	100(0)	-1.28	1.28	0.000*
5 min	100 (0)	-1.28	1.28	0.000*
8 min	100 (0)	-1.28	1.28	0.000*

* p value showing significance

Table 14. Intra group comparison of SPO_2 with Tukey – Kramer test in group II (0.5 % Ropivacaine) baseline to different time intervals.

Time Intervals	Group II Mean (SD)	Mean Difference (PI – various time intervals)	Percentage Change from Basal	P value
PI (Baseline)	98.72(0.67)			
PB (Pre block)	99.20(0.57)	0.48	0.49	0.000*
DB (During block)	99.64(0.47)	0.92	0.93	0.000*
BP (Before pin)	99.8(0.41)	1.08	1.09	0.000*
DP (During pin)	100(0)	1.28	1.29	0.000*
1 min	100 (0)	1.28	1.29	0.000*
3 min	100 (0)	1.28	1.29	0.000*
5 min	100 (0)	1.28	1.29	0.000*
8 min	100(0)	1.28	1.29	0.000*

* p value showing significance.

Inter- group comparisons :

HR, SBP, DBP, MAP, SPO_2were compared between groups I & II at various time intervals using repeated measures of ANOVA. It was found to be statistically insignificant (p>0.05) between the two groups. Later Tukey -Kramer multiple comparison tests was also done between the two groups.

Table 15. Between Group Analysis using repeated measures of ANOVA.

Parameters	Degree of freedom	Sum of squares	Mean squares	F value	P value
SBP	1	3767.12	3767.12	5.21	0.027
DBP	1	0.1089	0.1089	0.00	0.987
MAP	1	1223.476	1223.476	2.01	0.163
HR	1	1.3889	1.3889	0.00	0.975
SPO2	1	0.0089	0.0089	0.02	0.882

SYSTOLIC BLOOD PRESSURE (SBP).

SBP was compared between groups I & II at various time intervals and was found to be statistically insignificant (p>0.05) between the two groups (Table 16).

Table 16. Inter group comparisons of SBP at different time intervals using Tukey – Kramer test in group I and group II.

Time Intervals	Group I Mean	Group II Mean	Mean Difference	P value
PI (Baseline)	134.24	131.44	2.8	0.999
PB (Pre block)	138.76	132.32	6.44	0.650
DB (During block)	146.04	146.56	-0.52	1.000
BP (Before Pin)	131.4	130.2	1.2	1.000
DP (During Pin)	146.44	135.48	10.96	0.008*
1 min	139.08	127.72	11.36	0.004*
3 min	132.88	122.04	10.84	0.009*
5 min	125.8	118.92	6.88	0.527
8 min	116.88	114.76	2.12	0.999

* p value showing significance

DIASTOLIC BLOOD PRESSURE

DBP was compared between groups I & II at various time intervals and was found to be statistically insignificant (p>0.05) between the two groups**.** (Table 17).

Table 17. Inter group comparison of DBP at different time intervals using Tukey – Kramer test in group I and group II.

Time Intervals	Group I Mean	Group II Mean	Mean Difference	P value
PI (Baseline)	78.76	81.52	2.76	0.994
PB (Pre block)	77.72	75.96	1.76	0.999
DB (During Block)	85.44	89.64	4.2	0.777
BP (Before Pin)	78.72	80.12	1.4	0.999
DP (During Pin)	90.16	83.48	6.68	0.058
1 min	83.8	81.76	2.04	0.999
3 min	79.52	77.72	1.8	0.999
5 min	74.4	76.6	2.2	0.999
8 min	72.2	73.64	1.44	0.999

MEAN ARTERIAL PRESSURE:

MAP was compared between groups I & II at various time intervals and was found to be statistically insignificant (p>0.05) between the two groups (Table 18).

Table 18. Inter group comparison of MAP at different time intervals using Tukey – Kramer test in group I and group II.

Time Intervals	Group I Mean	Group II Mean	Mean Difference	P value
PI (Baseline)	96.92	98.4	1.48	1.000
PB (Pre block)	96.04	93.76	2.28	0.999
DB (During Block)	107.56	103.24	4.32	0.857
BP (Before Pin)	98.4	96.72	1.68	0.999
DP (During Pin)	109.8	100.12	9.68	0.000*
1 min	102.8	96.96	5.84	0.357
3 min	98.8	93.24	5.56	0.451
5 min	92.96	91.84	1.12	1.000
8 min	88.44	87.76	0.68	1.000

* p value showing significance.

HEART RATE

HR was compared between groups I & II at various time intervals and was found to be statistically insignificant (p>0.05) between the two groups.(Table 19).

Table 19.Inter group comparison of HR at different time intervals using Tukey – Kramer test in Group I and Group II.

Time Intervals	Group I Mean	Group II Mean	Mean Difference	P value
PI (Baseline)	73.4	73.68	0.28	1.000
PB (Pre block)	78.2	75.2	3	0.981
DB (During Block)	84.44	89.32	4.88	0.453
BP (Before Pin)	80.48	78.48	2.0	0.999
DP (During Pin)	86.6	86.24	0.36	1.000
1 min	84.36	81.64	2.72	0.993
3 min	79.76	78.32	1.44	0.999
5 min	76.52	78.52	2	0.999
8 min	72.92	74.28	1.36	0.999

*p value showing significance.

SPO_2

SPO_2 was compared between groups I & II at various time intervals and was found to be statistically insignificant ($p>0.05$) between the two groups (Table 20).

Table 20. Inter group comparison of SPO_2 at different time intervals using Tukey – Kramer test in group I and group II.

Time Intervals	Group I Mean	Group II Mean	Mean Difference	P value
PI (Baseline)	98.72	98.72	0	1.000
PB (Pre block)	99.24	99.2	0.04	1.000
DB (During Block)	99.68	99.64	0.04	1.000
BP (During Block)	99.92	99.8	0.12	0.998
DP (During Pin)	99.92	100	0.08	0.999
1 min	99.96	100	0.04	1.000
3 min	100	100	0	1.000
5 min	100	100	0	1.000
8 min	100	100	0	1.000

DISCUSSION:

Hemodynamic response to skull pin insertion includes tachycardia and hypertension. This is associated with a precipitous rise in intracranial pressure (ICP). This increase in heart rate and blood pressure is undesirable in those with coronary heart disease in whom the myocardium is vulnerable to hemodynamic stress and may precipitate myocardial ischemia, pulmonary oedema (16).

Different studies suggested that wide variations in blood pressures or mean arterial pressures are undesirable in patients undergoing craniotomy and an abrupt increases in HR and BP, are most likely to occur during the time of pin placement, scalp incision, periosteal detachment, dural opening, and brain retraction, may instigate an increased risk for premature rupture of an aneurysm, venous hemorrhage, sudden increase in intracranial pressure, and worsening brain edema. (8,11).

In a patient undergoing craniotomy for an intracranial mass the primary concern is the rise in ICP associated with the hemodynamic perturbations as a result of pinning.

In patients with intracranial mass lesions there is abnormal autoregulation of cerebral blood flow and hence even a slight increase in the arterial pressure, can lead to increase in ICP.[1]

Moreover uncontrolled increase in blood pressure can precipitate cerebral edema and Herniation. [2]

In order to attenuate the stress responses to noxious stimuli, other interventions such as deepening the depth of anaesthesia through inhalational anaesthetics or increasing the depth of analgesia via intravenous opiods have been in practice. Either of the intervention have their own drawbacks.

When depth of anaesthesia is increased with the volatile anaesthetics (isoflurane, desflurane) beyond 1.5 MAC, cerebral autoregulation is impaired .

Similarly, when the depth of analgesia is increased with intravenous opioids, problems related to emergence can also occur.

A few studies claimed the superiority of scalp infiltration with local anaesthetic over bolus doses of opioids. Accordingly the infiltration technique carries the advantages of rapid onset of analgesia, no additional increase in depth of anaesthesia, effective attenuation of haemodynamic perturbations and requirement of small volumes of drug. However, these techniques have some disadvantages like, it is effective only if a couple of minutes are allowed to elapse between infiltrations and pinning. The infiltration is so localized that a reapplication at a different site requires infiltration again. Reapplication of pins is not an uncommon event in neurosurgical practice. The multiple injections required increases the risk of needle stick injury.[1,5,6,12].

Pinosky *et al* [8] performed a scalp block with 0.5% bupivacaine which successfully blunted the stress response to skull pin placement. Moreover no patient who received a bupivacaine skull block required additional manoeuvers to control the sympathetic response to head pinning

Another two studies published stated that Scalp block with local anaesthetics have been found to be quite effective in attenuating the hemodynamic response to pinning. [4,8]

Geze *et al* [33] in their study of comparison of scalp block with 0.5% bupivacaine with Alfentanyl and 0.5% bupivacaine infiltration have demonstrated that not only does scalp block blunt the hemodynamic response but also the sympathoadrenal response as reflected by the reduced plasma cortisol and ACTH levels measured at the fifth and sixtieth minute after pinning.

An another study showed that adjuvant scalp block with 0.25 % bupivacaine facilitates stabilization of haemodynamics as measured by HR and MAP changes in patients undergoing craniotomy with general anesthesia.

Chaki *et al* [105] in their study, scalp block with 0.75% ropivacaine with lidocaine showed that heart rate and blood pressure after head pinning were marginally, but significantly, increased when compared with the baseline values.

All the above mentioned studies indicate that the haemodynamic disturbances that are secondary to skull pin placement are reduced to minimum because of scalp block.

Most of the above stated studies used either of the local anaesthetic (bupivacaine or ropivacaine) for scalp block. There are no studies which compared the efficacy of these two drugs in blunting the haemodynamic stress response used for the same technique.

Bupivacaine is a well-established long acting regional

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anaesthetic, It has a long duration of action, with an approximate half-life of 120 minutes when it is used in highly vascularized tissues such as the scalp. [4,15] Like all amide anaesthetics, it has been associated with cadiotoxicity when used in high concentration or when accidentally administered intravascularly.

Ropivacaine is a long acting regional anaesthetic that is structurally related to bupivacaine. It is a pure S [-] enantiomer, unlike bupivacaine, which is a racemic, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles.

Therefore we have undertaken this study to know which of the either drug is more efficient in attenuating the stress response to skull pin placement.

Thus in our study, all the observed hemodynamic variables such as heart rate (HR), Systolic Blood Pressure(SBP),Diastolic Blood Pressure(DBP) and Mean Arterial Blood Pressure(MAP) were recorded at various time points : Pre-induction (PI),Pre-block (PB),During block (DB),Before pin placement (BP), During pin placement (DP), 1 minute,3 minutes,5 minutes,8 minutes after pin placement. When compared within the group at different time intervals ,both in group I & II using repeated measures of ANOVA statistically significant ($p<0.05$) difference was observed. Later Tukey Kramer multiple comparison tests were done within the groups to find out at time points the changes were significant.

Within the group analysis:
In Bupivacaine group (group I) the SBP on comparison within the groups was found to be statistically significant ($p>0.05$) from the baseline value at time of giving the block (8.79 %), at pin placement(9.10%) and at 8 minutes (12.93%).

Where as in Ropivacaine group (group II) significant change ($p <0.05$) was observed during the block (11.50%),at 5 minues (9.54%) and 8 minutes (12.69%) after the pin placement.

The changes in the SBP were less than 20 % in either of the groups, which is clinically an acceptable change in clinical practice of anaesthesia. [77]

The DBP in Bupivacaine group (group I) on comparison within the groups was found to be statistically significant ($p <0.05$) from the baseline value during block (8.48%) and pin placement (14.47%), wheras in Ropivacaine group (group II) significant ($p <0.05$) changes were observed during the block (9.92%), after the pin placement. Changes in the DBP were also less than 20 % in either of the groups.

The MAP in Bupivacaine group (group I) on comparison within the groups was found to be statistically significant ($p <0.05$) from the baseline value at time of giving the block (10.97 %), at pin placement (13.3%) and at 8 minutes (8.75%).

Where as in Ropivacaine group (group II) significant ($p <0.05$) change observed at 8 minutes (10.81%) after the pin placement.

Since the changes in the MAP were also less than 20 % in either of the groups, they were considered clinically acceptable.

The HR in Bupivacaine group (group I) the HR on comparison within the groups was found to be statistically significant ($p <0.05$) from the baseline value at time of giving the block(15.04 %), at pin placement(17.98%),and 1 minute after pin placement (14.93%) but clinically insignificant (<20%) where as in Ropivacaine group (group II) significant ($p <0.05$) change observed during the block (18.52%),at pin placement (17.04%) and at 1 minute after pin placement (10.08%) after the pin placement.

Since the changes in the HR were less than 20 % in either of the groups, they were considered clinically acceptable.

These hemodynamic variables are similar to the study by Chaki et al [105] by using mixture of equal volumes of 2 % lidicaine and 0.75 % ropivacaine with epinephrine (5µg/kg).Where The heart rate and blood pressure were significantly increased after head pinning ,when compared with values recorded before head pinning.

The changes in SPO_2 on comparison within the groups was found to be statistically significant ($p < 0.05$) at all the time interval in both the groups,obviously because of ventilating with 40 % oxygen.

Intergroup analysis:
Intergroup comparison with group I (0.5% Bupivacaine) and group II (0.5% Ropivacaine) showed that there was no statistically significant difference between the two groups in all the haemodynamic parameters at all the time intervals. We could not access any such study comparing bupivacaine and ropivacaine in the literature search.

LIMITATIONS:
1)In our study,depth of anesthesia was not monitored using entropy or bispectral index.with which the study would have been more authentic.

2)Post operative analgesia was not evaluated with which the additional benefits of scalp block would have been known.

CONCLUSIONS AND RECOMMENDATIONS:
1) Statistical analysis within the bupivacaine group (group I) and ropivacaine group (group II) demonstrated significant increase ($p<0.05$) in all haemodynamic responses namely systolic blood pressure, diastolic blood pressure, mean arterial pressures,heart rate,during the administration block and during the pin placement.

2) But analysis between group I and group II proved that the haemodynamic responses were statistically insignificant ($p>0.05$).

Thus we conclude that, both 0.5% Bupivacaine and 0.5% Ropivacaine, when used in scalp block to attenuate the stress response to skull pin placement in craniotomy patients, showed statistically significant ($p < 0.5\%$) increase but clinically an acceptable change in practice of anaesthesia.

Since there is no superiority of either of the drug in attenuating the haemodynamic stress responses to skull pin placement over each other,0.5% ropivacaine may be used instead of 0.5% bupivacaine in view of its better cardiostability over bupivacaine.

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REFERENCES:

1. Paulson OB, Strandgaard S, Edvinsson L. Cerebral autoregulation. Cerebrovasc.Brain Metab Rev. 1990;2(2):161-92.
2. Schutta HS, Kassell NF, Langfitt TW. Brain swelling produced by injury and aggravated by arterial hypertension. A light and electron microscopic study. Brain.1968;91(2):281-94.
3. Gazoni FM, Pouratian N, Nemergut EC. Effect of ropivacaine skull block on perioperative outcomes in patients with supratentorial brain tumors and comparison with remifentanil: a pilot study. J Neurosurg. 2008;109(1):44-9.
4. Smith FJ, van der Merwe CJ, Becker PJ. Attenuation of the haemodynamic response to placement of the Mayfield skull pin head holder: alfentanil versus scalp block. Southern African Journal of Anaesthesia & Analgesia. 2002;8(4):4-11.
5. Yildiz K, Madenoglu H, Dogru K, Kotanoglu MS, Akin A, Boyaci A. The effects of intravenous fentanyl and intravenous fentanyl combined with bupivacaine infiltration on the hemodynamic response to skull pin insertion. J Neurosurg Anesthesiol.2005;17(1):9-12.
6. Hillman DR, Rung GW, Thompson WR, Davis NJ. The effect of bupivacaine scalp infiltration on the hemodynamic response to craniotomy under general anesthesia.Anesthesiology. 1987;67(6):1001-3.
7. Kuthiala G, Chaudhary G. Ropivacaine: A review of its pharmacology and clinical use. Indian journal of anaesthesia. 2011;55(2):104-10.
8. Pinosky ML, Fishman RL, Reeves ST, Harvey SC, Patel S, Palesch Y, et al. The effect of bupivacaine skull block on the hemodynamic response to craniotomy. Anesthesia and analgesia. 1996;83(6):1256-61.
9. Boos D.L., Stirt J.A. Pharmacology. In: R.J. S, J.A. S, D.J. S, editors. Manual of neuroanesthesia. Toronto: Decker; 1987. p. 37-66.
10. Feldman HS, Arthur GR, Covino BG. Comparative systemic toxicity of convulsant and supraconvulsant doses of intravenous ropivacaine, bupivacaine, and lidocaine in the conscious dog. Anesthesia and analgesia. 1989;69(6):794-801.
11. Moller R, Covino BG. Cardiac electrophysiologic properties of bupivacaine and lidocaine compared with those of ropivacaine, a new amide local anesthetic. Anesthesiology. 1990;72(2):322-9.
12. Papangelou A, Radzik BR, Smith T, Gottschalk A. A Review of scalp blockade for cranial surgery.Journal of Clinical Anesthesia (2013)25,150-159.
13. Osborn I, Sebeo J. "Scalp Block" During craniotomy: A Classic Technique Revisited.Journal of Neurosurgical Anesthesiology 2010;22:187-194.
14. Casati A, Fanelli G, Cappelleri G, Beccaria P, Magistris L, Borghi B, Torri G. A Comparision of 0.5%Bupivacaine.0.5%Ropivacaine, and 0.75% Ropivacaine for Interscalene Brachial Plexus Block.Anesthesia Analgesia 1998:87:1316-9.
15. Lehari S, Lyngdoh B, Jain S, DK C. Instrumentation for microneurosurgical procedures. Textbook of Operative Neurosurgery 3. 3 ed. New Delhi: Jaypee Brothers; 2011. p. 2317-32.
16. Shapiro HM. Intracranial hypertension: Therapeutics and anesthetic considerations. Anesthesiology 1975; 43:445-70.
17. Mokri B. The Monro-Kellie hypothesis: applications in CSF volume depletion. Neurology 2001,Jun 26; 56(12):1746-48.
18. Tans JT, Poortvliet DC. Relation between compliance and resistance to outflow of CSF in adult hydrocephalus. J neurosurg 1989; 71:59-62.
19. Bowman GJ, Muizelaar JP, Bandho K. Blood pressure and intracranial pressure volume dynamics in severe head injury: the relationship with cerebral blood flow. J neurosurg 1992; 77:15-19.
20. Laurence T Dunn. Raised intracranial pressure . J Neurol Neurosurg Psychiatry 2002;73:23.
21. Paulson OB, Strandgaard S, Edvinsson L. Cerebral autoregulation. Cerebrovasc Brain Metab Rev 1990; 2:161-92.
22. Bullock R, Chesnut R, Clifton G. Guidelines for the management of severe head injury. J Neurotrauma 2000; 17:453-553.
23. Laurence T Dunn. Raised intracranial pressure . J Neurol Neurosurg Psychiatry 2002;6-9.
24 Roy WL, Edelist G, Gilbert B. Myocardial ischemia during non-cardiac surgical procedures in patients with coronary-artery disease. Anesthesiology. 1979;51(5):393-7.
25. Shapiro HM, Drummond J. Neurosurgical anesthesia. In: RD M, RF C, ED M, JGR, MF R, JJ S, editors. Anesthesia 4. New York, Edinburgh, London, Madrid, Melbourne, Milan, Tokyo: Churchill Livingstone; 1994. p. 1897-946.
26. Schaffranietz L, Ruffert H, Trantakis C, Seifert V. [Effect of local anesthetics on hemodynamic effects during Mayfield skull clamp fixation in neurosurgery using total intravenous anesthesia]. Anaesthesiol Reanim. 1999;24(2):51-4.
27. Greenberg MS. Operations and Procedures. 7 ed. Greenberg MS, editor. New York: Thieme Medical Publishers.
28. Dershwitz, Mark et al. Remifentanil : A truly-short-acting opioid.Seminars in Anesthesia, Perioperative Medicine and Pain , Volume 15 , Issue 1 , 88 – 96.
29. Jamali S, Archer D, Ravussin P, Bonnafous M, David P, Ecoffey C. The effect of skull-pin insertion on cerebrospinal fluid pressure and cerebral perfusion pressure: influence of sufentanil and fentanyl. Anesthesia and analgesia. 1997;84(6):1292-6.
30. Jamali S, Ravussin P, Archer D, Goutallier D, Parker F, Ecoffey C. The effects of bolus administration of opioids on cerebrospinal fluid pressure in patients with supratentorial lesions. Anesthesia and analgesia. 1996;82(3):600-6.
31. Rubial M, Castells MV, Gargallo MC, Madrid JL. [Regional blockage for arterial blood pressure control during placement of head holder in neurosurgery]. Rev Esp Anestesiol Reanim. 1992;39(5):282-4.
32. Colley PS, Heavner JE. Blood levels of bupivacaine after injection into the scalp with and without epinephrine. Anesthesiology. 1981;54(1):81-4.
33. Geze S, Yilmaz AA, Tuzuner F. The effect of scalp block and local infiltration on the haemodynamic and stress response to skull-pin placement for craniotomy. Eur J Anaesthesiol. 2009;26(4):298-303.
34. El Dawlatlyr, Khalid Abdullaht, Al Sherif,Zain Watidy,Waleed R Jamjoom,Bilal Murshid,Delvi. Effect of small dose intravenous dexmedetomidine and/or local anaesthetic infiltration on haemodynamic responses to skull pin placement.Pan Arab Journal of Neurosurgery 02/2006; 10(1):29-33.
35. Geze S, Yilmaz AA, Tuzuner F. The effect of scalp block and local infiltration on the haemodynamic and stress response to skull-pin placement for craniotomy.European Journal of Anaesthesiology:2009 – volume 26- Issue 4 – p298-303.