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Original research article

A Comparative Study of Hemodynamic Response to Incision/Pinning With Scalp Block Versuspropofol Infusion In Neurosurgical Procedures

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Abstract

Aim: to find the role of caudal epidural steroid injections in the management of chronic low backache.

Material and methods: This prospective observational study was carried out in the **Background and Aims:** Scalp blocks combined with general anaesthesiaprovides stable perioperative haemodynamics and analgesia besides reducing pin and incision response.Maintaining appropriate depth of anesthesia by starting propofol infusionalso provides stable hemodynamics. Therefore,we have studied and compared the effects of scalp nerve block VS propofol infusion during skull pinning / skin incision while performing craniotomies and also measured the postoperative pain using VAS scores.

Material and Methods:Forty ASA I, II, III patients scheduled for elective craniotomies, were enrolled in this prospective, randomised, double blind study. Group A scalp block was given (0.5% bupivacaine) and in Group B propofol infusion was started(0.5-1mg/kg/hour).Bilateral block was given immediately after induction.Propofol infusion was started and titrated according to the haemodynamics. Heart rate and blood pressure were recorded before induction, after incision/pinning and till 2 hours after extubation. Fentanyl 1microgram/kg was given if a 20% increase in heart rate or blood pressure is there.Post operatively hemodynamics and VAS score was recorded.If VAS score is above 3 rescue analgesia was given.Any intraoperative complications were noted.All analysis was carried out by using SPSS software version 21. **Results:**There were significant increase in heart rate and blood pressure during head pinning/incision in the propofol infusion group as compared to scalp block group.

Conclusion: We conclude that scalp block, blunts the hemodynamic response to skull pinning/skin incision, decrease the incidence of postoperative pain ,and the need of rescue analgesics(opiods,NSAIDS) ,hence should be considered in conjunction with general anesthesia for craniotomy.

Key words:Scalpblock,propofol infusion,pinning,incision,craniotomies.

Introduction

For any neurosurgerical procedure, maintaining perioperative hemodynamic stability and optimal cerebral perfusion is of outmost importance[1]. Changes in blood pressure and heart rate can have adverse effect on patient's cardiovascular system and intracranial pressure, which inturn decreases cerebral perfusion pressure and also can increase risk of aneurysm rupture [2]. Combining regional anesthesia technique of scalp block just after induction of general anesthesia offers several advantages for most patients. Blocking the sensory nerves that innervates cranium helps to blunt the hemodynamic response to noxious stimuli stabilizing intraoperative hemodynamics, decreasing the amount of opioid need, and decreasing postoperative pain,thus allowing smooth and faster emergence with lower incidence of chronic pain [3,4]. Scalp blocks proved useful during awake craniotomy and for supplementation to general anesthesia for other forms of craniotomies [1,5].Neurosurgery cases are usually performed under general anesthesia supplemented with different modalities, still they show wide haemodynamic fluctuations. The need of stable perioperative hemodynamics is of paramount importance. A number of modalities have been tried, but the comparison of scalp block VS propofol infusion after induction of general anesthesia is less. Hence a study to compare the two modalities has been done.

Aim: Aim of the study was to investigate the effect of scalp block with 0.5% bupivacaine VS propofol infusion in preventing hemodynamic response to incision/pinning in neurosurgical procedures, and also to compare the effect on post-operative analgesia using VAS scores.

Objective: The main objective of the study was to compare the effects of scalp block vs IV propofol infusion on hemodynamic responses to incision/pinning in terms of heart rate and blood pressure (Systolic/diastolic and mean arterial pressure) in cases undergoing neurosurgical procedures.

Material and Methods:

It was a prospective, double-blinded, randomized trialon patients undergoing elective craniotomy Department of Anesthesia, Lilavati Hospital and Research Centre, Mumbai. After Institutional Ethics committee approval and written patient consent of 40 adult ASA grade I, II, III patients, undergoing elective surgery under general aesthesia for craniotomies lasting for 60 to 360 minutes were enrolled for the study. Our exclusion criteria included emergency cases, patients withanyallergy to propofol and bupivacaine, ASA grade IV, alcohol and substance addiction and on any anticoagulant medication, patient refusal.

Preoperative investigations and assessment:

Pre anesthetic checkup was done. Details of premedication especially hypertension was noted. Resting blood pressure was noted before surgery.Routine investigations along with 2D ECHO was done The patients were randomly allocated into groups of 20 each .Group A: Patient receives scalp Block with 0.5% bupivacaine (2-3mg /kg) andGroup B with patient receiving propofol infusion (0.5-1 mg/kg/hour).Patient was monitored with Spo_2, electrocardiogram, non invasive blood pressure,end tidal co2 ,temperature.Anaesthesia induction was done with intravenous midazolam 0.03 mg/kg and fentanyl 2 -3mcg/kg ,intravenous propofol in dose of 2 mg/kg was given till loss of eyelash reflex, followed by intravenous cisatracurium (0.15mg/kg).Maintainence was done with sevoflurane (End tidal concentration-1.5%) along with oxygen 50% and nitrous oxide 50%. All the patient were given iv paracetamol (1 gram) and iv diclofenac(75milligram) slowly intraoperatively after ruling out allergies and rise in creatinine.

Bilateral scalp block wasimmediately given after induction with 25G needle to block subraorbital nerve and supratrochlear nerve near the supraorbital groove,zygomaticotemporal nerve 1 cm away from outer canthus of eye ,auriculotemporal nerve near tragus,lesser and greater occipital nerve on the line joining mastoid process and occipital protruberance..

Scalp block effectiveness was evaluated through maintained hemodynamic stability during painful stimuli of surgery (incision /pinning).Time of Scalp Block and incision was noted in Group A.In After the induction Propofol infusion was started (0.5-1mg/kg/hr), tolerated to hemodynamics, which was continued till the pinning or incision was done. Time was noted.

Hemodynamic parameters were monitored :before induction, after anesthesia induction, after incision/ pinning and at 30 min,45min,60min,90min,120min after extubation

Our primary endpoint was comparison of intraoperative haemodynamics between the two groups. Secondary endpoints studied included postoperative duration of analgesia and intraoperative hemodynamic com plications (tachycardia,bradycardia,hypotension,and hypertension) Post-operative . VAS Score was assessed at 15 minutes, 30 minutes, 45 minutes ,60 minutes,90 minutes and 120 minutes after extubation.When VAS score was above 3,rescue analgesia iv fentanyl 1mcg/kg and tramadol 50mg was given and time noted and thereafter the patient was discontinued from surgery.

Intraoperative decrease in mean arterial pressure (MAP) <30% was treated with ephedrine bolus 6 mg. Increase in MAP and/or tachycardia >20% , fentanyl 0.5 µg/kg bolus was injected twice, >30% increase was treated with esmolol 0.5 mg/kg. Bradycardia (pulse <50/min) was treated with glycopyrrolate 0.004 mg/kg.

Patients requiring postoperative ventilator care, patients with deteriorated glasgow coma scale or patients unable to communicate were withdrawn from the study.

Results

The demographic data is comparable in both groups as seen from table 1.

Table1: comparison of age, weight, height & mean duration of surgery

Variables	Group	N	Mean	SD	p- value
Age(years)	A	20	38.3	9.43	0.08
	B	20	43.05	9.2	
Weight(kg)	A	20	65.2	8.76	0.553
	B	20	66.8	8.13	
Height(cm)	A	20	157.1	5.31	0.682
	B	20	157.7	3.76	
Duration of Surgery (hrs)	A	20	2.56	0.73	0.044
	B	20	3.05	0.76	

The demographic data is comparable in both groups as seen from [Table 1]. Their preoperative haemodynamic parameters were similar (P>0.05). There was a significant reduction in MAP in group A against group B during both pining and incision. During incision HR, MAP was significantly lower in group A as compared to group B, [Figure 1] and [Figure 2]. Postoperative HR MAP was also significantly reduced in group A especially at 1 and 3 hours. Intraoperative use of fentanyl was significantly lower in group A as compared to group B . VAS score was significantly lower in scalp block group as compared to IV propofol group, till 2 hours post induction.(Figure 3)The most significant difference was seen in the time to rescue analgesia which was almost double the time in group A and in only 15% of individuals as compared to group B ,in which it was used for 85% of individuals.(Figure 4) Also the rate of intraoperative haemodynamic complications were significantly higher in group B.

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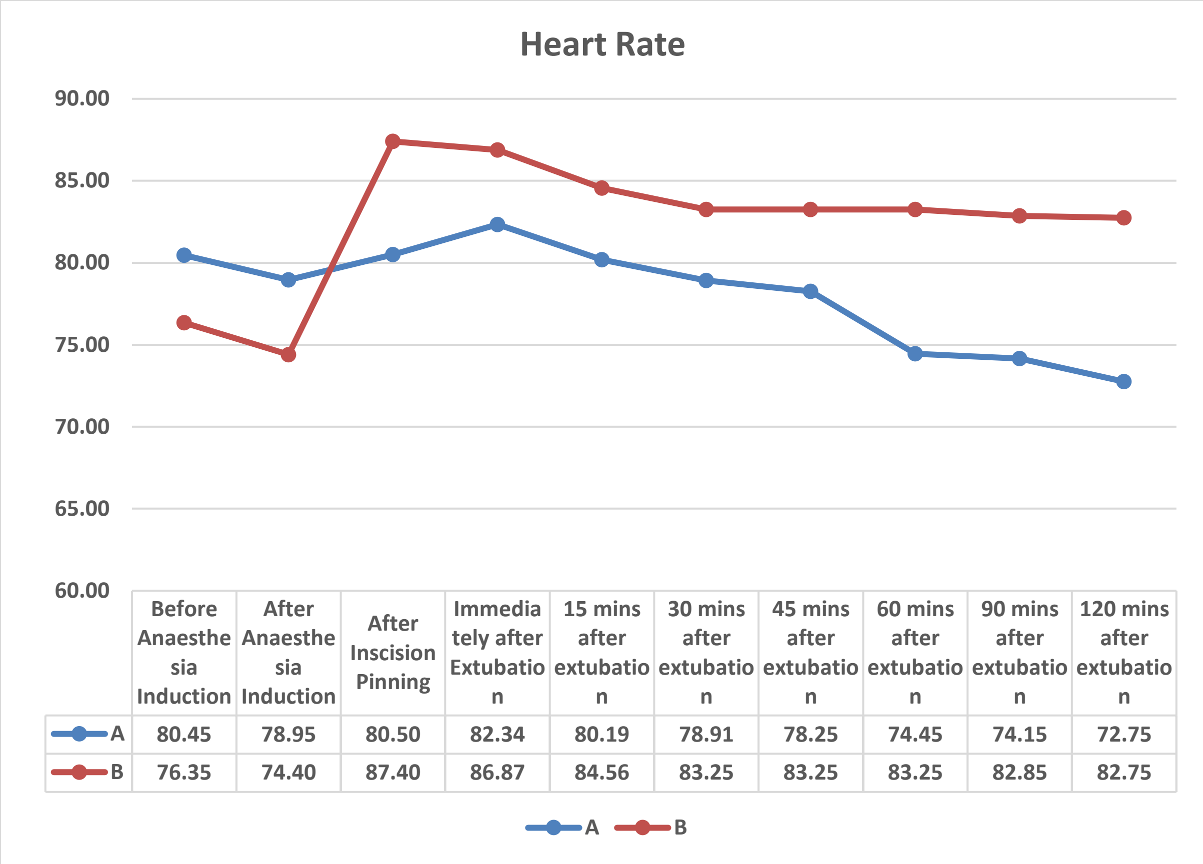
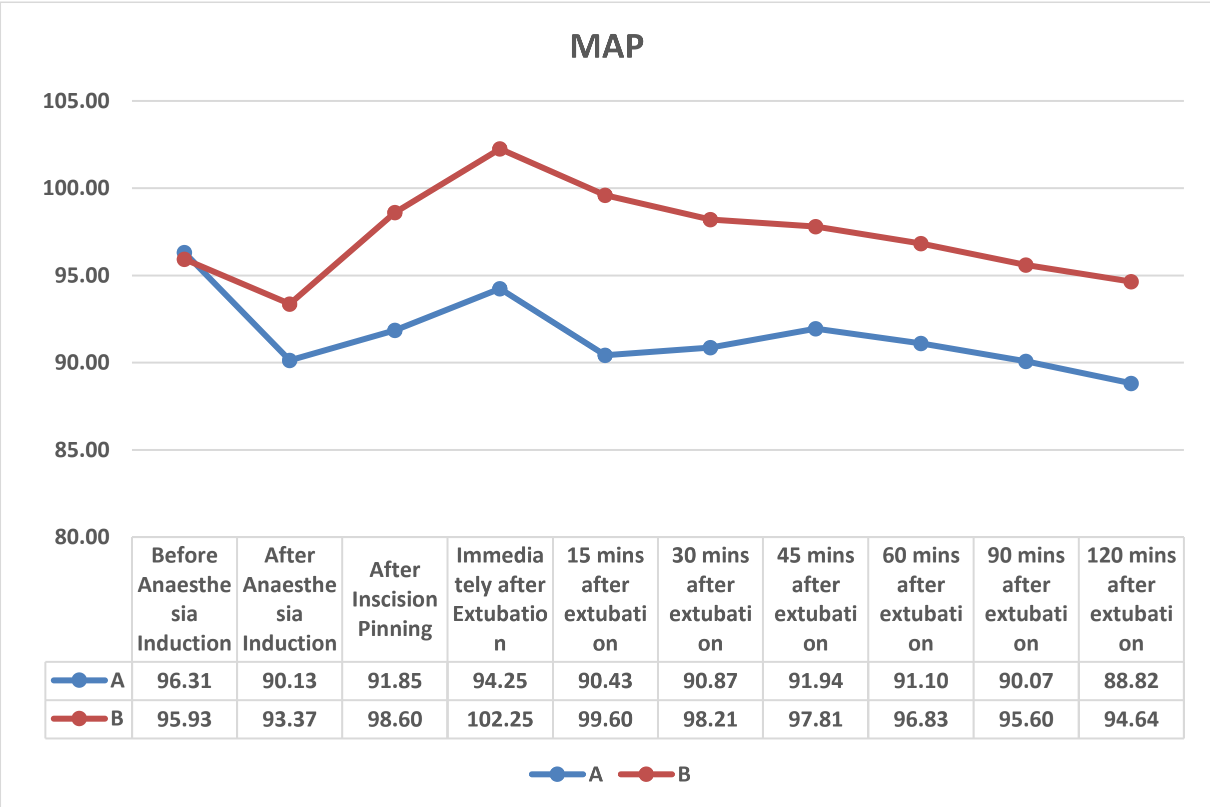


	Before Anaesthesia Induction	After Anaesthesia Induction	After Inscision Pinning	Immediately after Extubation	15 mins after extubation	30 mins after extubation	45 mins after extubation	60 mins after extubation	90 mins after extubation	120 mins after extubation
A	80.45	78.95	80.50	82.34	80.19	78.91	78.25	74.45	74.15	72.75
B	76.35	74.40	87.40	86.87	84.56	83.25	83.25	83.25	82.85	82.75

Figure 1: Comparison of Heart rate



	Before Anaesthesia Induction	After Anaesthesia Induction	After Inscision Pinning	Immediately after Extubation	15 mins after extubation	30 mins after extubation	45 mins after extubation	60 mins after extubation	90 mins after extubation	120 mins after extubation
A	96.31	90.13	91.85	94.25	90.43	90.87	91.94	91.10	90.07	88.82
B	95.93	93.37	98.60	102.25	99.60	98.21	97.81	96.83	95.60	94.64

Figure 2: Comparison of mean arterial pressure

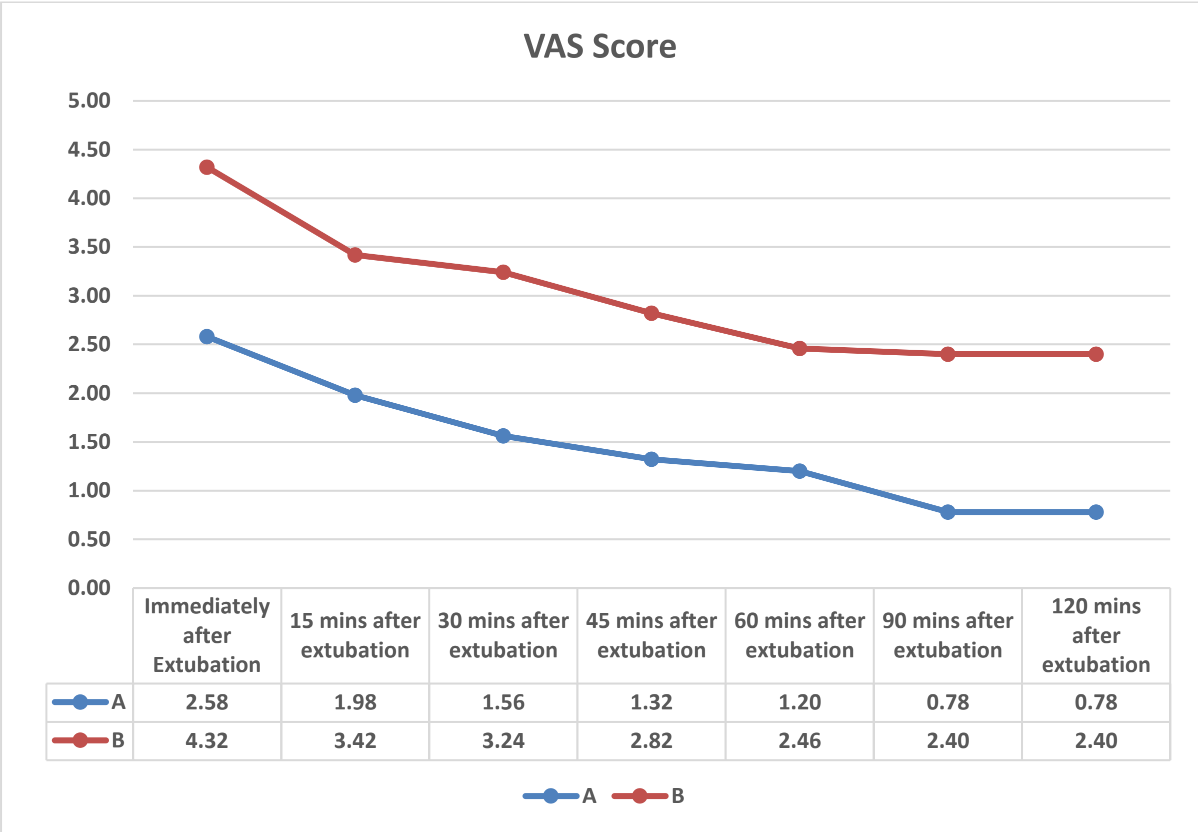


Figure3: Comparison of VAS Score

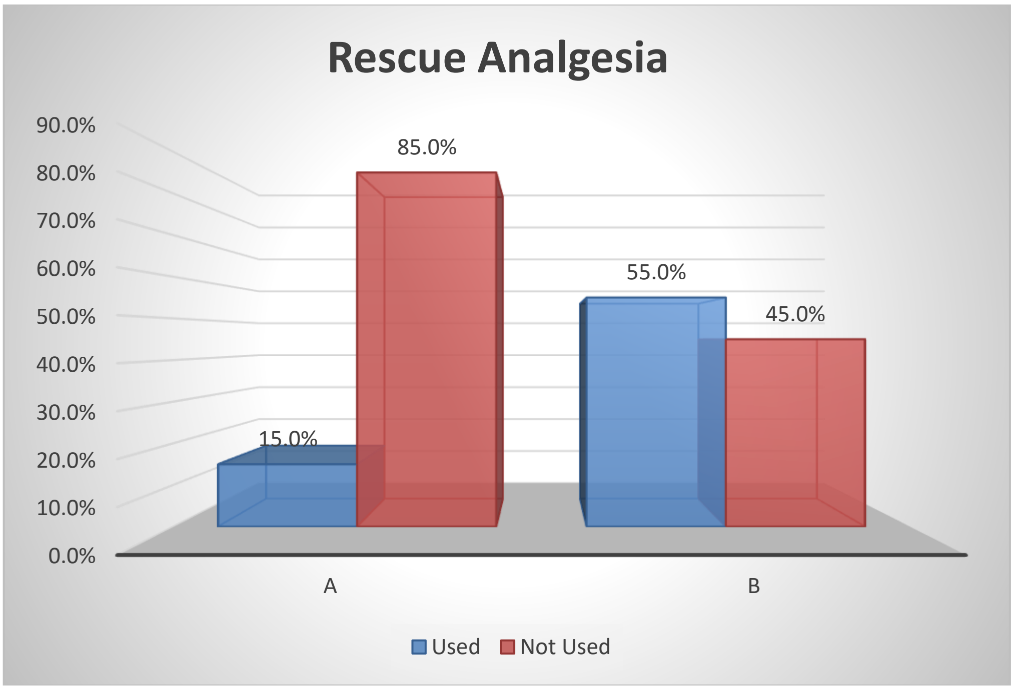


Figure 4: Comparison of usage of rescue analgesia

Discussion

In neurosurgery cases, laryngoscopy, skull-pin applications/incision, interventions to the periosteum and dura, are painful stimulus which can lead to acute hypertensive response [6] in patients. Following the skull-pin placement, efferent pain sensation generated from the periosteum results in severe acute hypertensive response due to sympathetic system activation and eventually, intracranial pressure increases. Prevention of acute hypertension secondary to these noxious stimulation, is highly desirable [7,8] and need to be controlled through different anesthetic modalities.

Sudden or prolonged reductions in blood pressure following the use of antihypertensive agents, opioids, and intravenous anaesthetics that blunt the haemodynamic response to head pinning are not considered as the first modality of treatment. [9,10].

The scalp block is an easy and effective method of blunting the blood pressure response and decreasing morbidity after craniotomy [11].Several studies to date have tested the efficacy of a number of local anaesthetic agents, including bupivacaine, in blunting the haemodynamic response and enhancing postoperative pain control [2,12].

Study done by Geze et al. [13] evaluated the effects of scalp blocks using 20 mL of 0.5% bupivacaine versus local infiltration on the haemodynamics and stress responses to skull pin insertion during craniotomy and found that the scalp block provided better haemodynamics and reduced the stress response during and after skull pin placement.

Lee et al. [14] also showed the efficacy of bupivacaine in blunting the haemodynamic response and reducing the need for rescue drugs due to hypertension and tachycardia.

Pinosky et al. [15] compared the efficacy of saline (as a control) and 0.5% bupivacaine to induce scalp block and reported that bupivacaine successfully blunted the haemodynamic response to head pinning . 9 out of 10 patients in control group require rescue analgesics.

Hillman et al. [16] reported that using 0.5% bupivacaine scalp infiltration significantly reduced blood pressure and heart rate changes during skin incision, scalp flap reflection.

Bloomfield et al. [17] demonstrated 0.25% bupivacaine with 1:400,000 adrenaline when given pre-incision blunt heart rate changes during dural and skin closure.

To the best of our knowledge, no previous study has compared scalp block with bupivacaine vs propofol infusion directly in preventing hemodynamic response in neurosurgical procedures.

The present study demonstrated that scalp nerve blocks with bupivacaine decreases the response to pinning and provides stabilization of hemodynamic responses in neurosurgical procedures with no increase in adverse reactions like nausea, bradycardia or hypotension(as in other modalities

Post-craniotomy pain is a topic of increased attention in neurosurgery and neuroanesthesia However, recent studies showed that craniotomies were associated with more severe pain than recognized [18], but the ideal analgesic for postoperative pain after craniotomy is not yet available [19].

Nguyen et al. [19] evaluated 30 patients who were randomised to receive a scalp block with either ropivacaine or normal saline. Over a 48-h postoperative period, the pain scores were assessed and found to be lower after ropivacaine infiltration, than in other group.

We found a significant prolongation of analgesia in group A as compared to B which is our secondary objective in this case.). Scalp block also provides more effective post-craniotomy analgesia, reduces chronic pain after craniotomy and decreases the requirement of subsequent rescue opioid analgesia in postoperative period.

Conclusion:

Study concludes that scalp block showed decreased response to incision/pinning as compared to propofol infusion and provides stabilization of hemodynamic responses in neurosurgical procedure, early postoperative pain and requirement of subsequent rescue analgesia.

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Conflict of interest:
There are no conflicts of interest.

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