



Preoperative regional scalp block versus intraoperative intravenous fentanyl for attenuating intraoperative surgical stress response to supratentorial craniotomy in adult patients under general anaesthesia

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ABSTRACT

During brain tumour resection a lot of noxious stimuli are released resulting in a significant hemodynamic and stress response, its control is challenging during anaesthesia, and can be evaluated by monitoring blood pressure (BP), heart rate (HR) Attenuating autonomic cardiovascular responses to pain resulting from skull pinning, skin incision, and craniotomy are considered significant benefits of Regional Scalp Block (RSB) in addition to reducing postoperative analgesic requirements. This study aims to evaluate the effect of preoperative regional scalp block (RSB) versus intraoperative intravenous fentanyl for attenuating intraoperative surgical stress response to supratentorial craniotomy in adult patients under general anaesthesia. The study included 30 patients randomly distributed into two equal groups with 15 patients in each, Group A: Preoperative RSB was done after induction of general anaesthesia and before skull pinning, Group C: Control group: patients were given conventional intraoperative analgesia in the form of intravenous fentanyl with no block. This study included patients with Supratentorial brain tumours were admitted to Zagazig University Hospitals. Patients have been gathered over two years duration from march 2018 to march 2020. The results showed that there were highly significant differences between RSB group and control group. Preoperative RSB showed advantages over Standard analgesia in terms of better attenuation of stress response to pain in the form of heart rate and blood pressure intraoperatively, decrease opioid consumption, lower Visual Analogue Score (VAS), Preoperative RSB can be performed easily in a short time with very high success rate allowing better intraoperative control of haemodynamics, less postoperative pain.

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INTRODUCTION

Attenuating cardiovascular responses to pain resulting from head pinning, skin incision, and craniotomy are considered potential benefits of RSB in addition to reducing postoperative analgesic requirements ([Guilfoyle et al., 2013](#)).

Sensory innervation of the scalp can be targeted at well-defined anatomical sites by infiltration of local anaesthetic (LA) in a technique known as regional scalp block (RSB) ([Osborn and Sebeo, 2010](#)).

Six sensory nerves are known to supply the scalp,

and they are branches of either the trigeminal or the cervical nerve, include the following:

Supratrochlear nerve — from the ophthalmic division of the trigeminal nerve; it innervates the medial plane of the scalp at the frontal region, up to the vertex.

Supraorbital nerve — from the ophthalmic division of the trigeminal nerve; it innervates the lateral plane of the scalp at the frontal region, up to the vertex.

Zygomaticotemporal nerve — from the maxillary division of the trigeminal nerve; it supplies the temporal area of scalp and skin over zygoma.

Auriculotemporal nerve — from the mandibular division of the trigeminal nerve; it innervates the temporal region of the scalp.

Lesser occipital nerve — from the cervical plexus (C2); it supplies the lateral part of the occipital area of the scalp.

Greater occipital nerve — from the posterior ramus of the second cervical nerve; it supplies the median occipital plane of the scalp, up to the vertex ([Osborn and Sebeo, 2010](#)).

Objectives

To assess cardiovascular response to pain in the form of intraoperative hemodynamic changes, to evaluate intraoperative fentanyl consumption and MAC of isoflurane. To evaluate postoperative pain by using a visual analogue scale. To assess the time of first rescue analgesic request in the postoperative period and to calculate the total dose of fentanyl consumption in the first 24 hours postoperative with its subsequent side effects may Impair assessment of neurological status and conceal intracranial complications in the early postoperative period.

PATIENTS AND METHODS

A total of 30 patients attending Zagazig University hospital from march 2018 to march 2020 were included in a prospective study. Written informed consent was obtained from all patients, and approval was given by the ethical research committee of Faculty of Medicine, Zagazig University. The work has been done along with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. Patients were randomly divided into three groups according to the type of anaesthetic technique:

Group A

Preoperative RSB were done after intubation and before skull pinning using bupivacaine 0.5% / lidocaine 2% mixture with epinephrine 1:200,000.

Group C

Control group, patients received standard intraoperative analgesia in the form of intravenous fentanyl with no block.

Inclusion criteria

Patients aged 21–60 years of both genders and ASA grade I-II (American society of anesthesiologists) Prepared to undergo craniotomy under general anesthesia for supratentorial tumours. Also, body mass index <35 kg/m².

Exclusion criteria

Disturbed conscious level (Glasgow coma score < 14) or Huge tumour with marked midline shift And incision extending beyond the areas covered by regional scalp block. LA Infiltration of the scalp preoperatively along the future incision or postoperatively along the wound edges only. Also, previous craniotomy and chronic use of analgesics or drug dependence. Uncontrolled hypertension. Finally, extensive surgeries lasting more than 6 hours or patient needing postoperative ventilatory support or any complications during the procedure such as massive intracranial haemorrhage.

Anaesthetic techniques

Preoperative Preparation

Patients were kept nil per orally according to standard protocol (6-8h for solids, and 2h for clear fluids). Routine monitors were applied to record: ECG, heart rate (HR), mean arterial blood pressure (MAP) "through arterial line", and peripheral oxygen saturation values as baseline readings. Intravenous 18 gauge cannula was inserted in addition to the central line. An arterial line was also needed. Induction of general anaesthesia with endotracheal intubation was done.

General anaesthesia

It was standardized for all patients in the two groups—preoxygenation with 100% oxygen for three minutes. Fentanyl 2 mcg/kg, propofol 2 mg/kg was intravenously administered for induction, and cisatracurium 0.1 mg/kg was given to aid intubation of the trachea. Endotracheal tube with suitable size was used to intubate the trachea. Mechanical ventilation was instituted to keep PaCO₂ between 30–35 mm Hg. Isoflurane/O₂ mixture MAC 1 with an incremental dose of cisatracurium was administered for maintenance. Mannitol (0.5 g/kg over 20 min after induction of anaesthesia), ondansetron (4 mg) and phenytoin (5 mg/kg if already loaded with 15 mg/kg) and dexamethasone 10mg IV then 4mg/6h intramuscular were given. Crystalloid was restricted to 3 ml/kg/h of normal saline while any

blood loss was replaced with an equal volume of blood or colloids if any increase in mean arterial pressure by more than 15 mm Hg or heart rate acceleration by more than ten beats/ minute, MAC of isoflurane was increased until reach the maximal end-tidal concentration of 1.2%. Suppose the blood pressure and heart rate still higher as noted, an extra dose of 0.5 mcg/kg of fentanyl was administrated.

After finishing skin closure, isoflurane was ceased; reversal of neuromuscular blockade was done with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg. Extubation was done when the patient was able to obey simple commands. Postoperatively all patients were given paracetamol (perfulgan) as standard intravenous analgesia (at a dose of 1gm for patients ≥ 50 Kg weight or 15mg/Kg for patients ≤ 50 Kg weight) every 6 hours. Visual analogue score (VAS) was assessed, In case of VAS was ≥ 7 , the plan was to give the patient 1 μ g/kg of fentanyl, and in case of VAS was 4-6, the plan was to give the patient 0.5 μ g/kg of fentanyl. And finally in case of VAS was 2 or 3, the plan was to give the patient 30 mg of ketorolac intravenous, and in case of VAS of 0 or 1, no analgesia was given. No additional rescue analgesics were administered

The two groups were compared regarding patient characteristics and medical history, intraoperative autonomic cardiovascular response to pain: heart rate and mean arterial blood pressure, the total amount of fentanyl used intraoperatively, MAC of isoflurane used intraoperatively, postoperative pain score: using Visual Analogue Scale (VAS score), time from extubation to the first request of rescue analgesia, a total dose of fentanyl consumption in the first 24 hours postoperative.

RSB Technique

For all patients in group A, the patient was positioned in a supine or semi-sitting position, the skin was disinfected and a 22 gauge needle 3 cm length containing the prepared mixture of local anaesthetics (bupivacaine 0.5% and lidocaine 2% mixture with epinephrine (1/200000 concentration) was inserted at multiple sites: The supraorbital nerve was blocked with 1.5 ml LA solution at the supraorbital notch, which is located at the supraorbital ridge above the pupil. The supratrochlear nerve was blocked with 1.5 ml of local anaesthetic (LA) solution injected at superior medial corner of the orbital ridge with the needle introduced perpendicular to the skin, The auriculotemporal nerve was blocked by injecting 3 ml of local anaesthetic solution at 1.5 cm in front of the ear at the same level of the tragus. With the needle perpendicular to the skin, 1.5 ml of LA was injected under the deep fascia, and

another 1.5 ml was injected superficially as the needle is withdrawn.

An injection of LA lateral blocked the zygomaticotemporal nerve to the orbit by forming a bridge between the area already anaesthetized around the zygomatic arch to the supraorbital ridge using 3ml of local anaesthetic. The greater and lesser occipital nerves were blocked with 5 ml in a band-like extension from the posterior occipital protuberance to immediately behind the ear. The postauricular branches of the great auricular nerve were blocked with 3 ml of local anaesthetic solution injected between skin and bone, 1.5 cm posterior to the ear at the level of the tragus. The injection was given into the subcutaneous tissue, to avoid accidental intravascular injection, careful aspiration was obligatory before injection of local anaesthetic. RSB was performed bilaterally. In group A the block was performed after induction of general anaesthesia and before skull pinning. Bilateral injection of 17 mL of local anaesthetic solution at six sites using a mixture of 1:1 bupivacaine 0.5% and lidocaine 2%. With taking into consideration not to exceed the maximum dose (5mg/kg for bupivacaine) and (7mg/kg for lidocaine).

RESULTS

Patient’s characteristics and medical history

There were non- significant differences among the studied groups concerning: age, gender weight, height, BMI, ASA class and medical history preoperatively (p>0.05 for all) (Table 1).

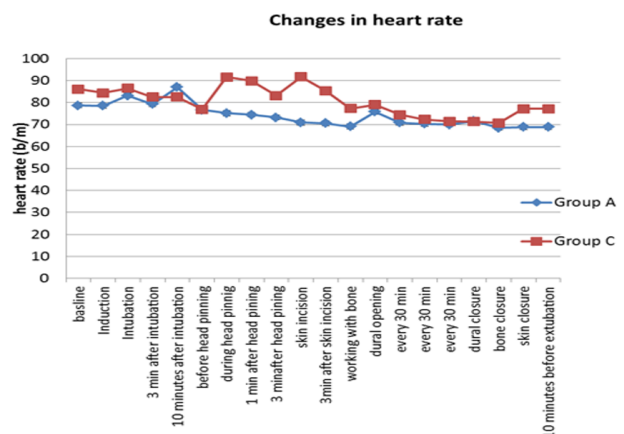


Figure 1: Intra-operative Heart rate (HR) at different times in the two studied groups (data were expressed as mean).

Intraoperative heart rate changes

There was a non-significant difference in HR among the two studied groups at baseline, induction, intubation, 3 minutes after intubation, 10 minutes after

intubation, before head pinning, dural opening, every 30 minutes intraoperatively after dural opening, dural closure and bone closure ($p > 0.05$ for all). There was highly statistically significant ($p < 0.001$) lower HR in group A (within normal limits) compared to the group C during head pinning, skin incision, 3 minutes after incision, skin closure and 10 minutes before extubation. There was statistically significant ($p < 0.05$) lower HR in group A (within normal limits) compared to group C during 1&3 min after head pinning and during working with the bone ($p > 0.05$) (Figure 1).

Intraoperative mean arterial pressure changes

There was a non-significant difference in MAP among the two studied groups at baseline, induction, intubation, 3 minutes after intubation, 10 minutes after intubation, before head pinning, dural opening,

every 30 minutes intraoperatively after dural opening, dural closure and bone closure ($p > 0.05$ for all). There was highly statistically significant ($p < 0.001$) lower MAP in group A (within normal limits) compared to the group C during head pinning, skin incision, 3 minutes after incision, skin closure and 10 minutes before extubation. There was statistically significant ($p < 0.05$) MAP in group A (within normal limits) compared to group C during 1&3 min after head pinning and during working with the bone ($p > 0.05$) (Figure 2).

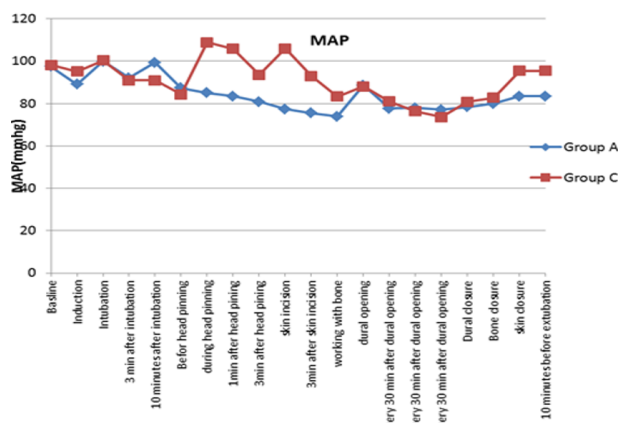


Figure 2: Intra-operative mean arterial pressure change at different times in the two studied groups (data were expressed as mean).

Total amount of fentanyl (μg) & isoflurane (MAC) used intraoperatively.

They were highly statistically significant ($p < 0.001$) lower in group A compared to group C ($p > 0.05$). (Table 2), (Figures 3 and 4).

Visual Analogue Scale (VAS)

It was highly statistical significant higher score

($p < 0.001$) in group C compared to group A at 30

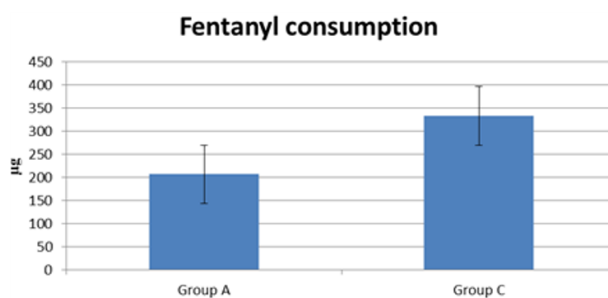


Figure 3: Comparing total dose of intraoperative fentanyl consumption among the studied two groups (error bars represent the standard error)

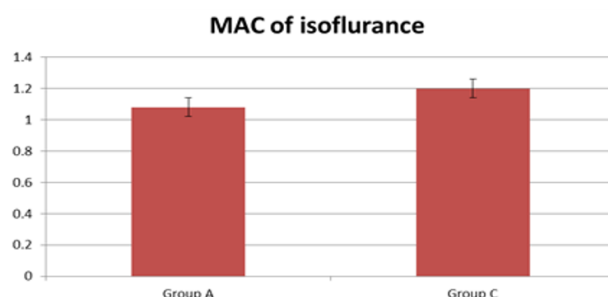


Figure 4: Comparison of intraoperative MAC of isoflurane among the studied two groups (error bars represent the standard error)

minutes, 1h, 2h and 4h:($p > 0.05$). It was a statistically significant higher score ($p < 0.05$) in group C compared to group A ($p > 0.05$) at 8h and 16h. There was no statistically significant difference ($p > 0.05$) among the two studied groups at 24 h (Table 3).

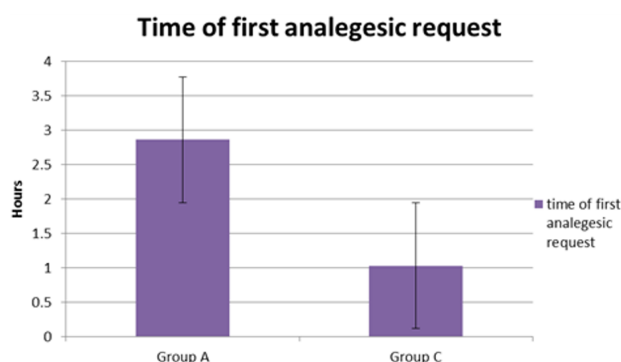


Figure 5: Comparing the time of the first request of rescue analgesia in the first 24h postoperative among the two studied groups (error bars represent the standard error)

Time from extubation to the first request of rescue analgesia and total dose of postoperative Fentanyl (μg) consumption in the first 24 hours. Regarding time from extubation to the first request of rescue analgesia, it was highly statistical significant longer

Table 1: Patients Characteristics and Medical History among Studied Groups

	Group A (n=15)		Group C (n=15)		t-test	P-value
Age(years)						
Mean \pm SD	42.9 \pm 11.7		42.07 \pm 11.1		0.2	0.8
Min-max	23-58		20-59			
Weight(kg)						
Mean \pm SD	84.7 \pm 12.3		82.9 \pm 10.2		0.4	0.8
Min-max	66-156		60-100			
Height(cm)						
Mean \pm SD	167.67 \pm 10.1		170.7 \pm 9.6		0.8	0.4
Min-max	156-185		155-188			
BMI(kg/m2)						
Mean \pm SD	24.13 \pm 4.3		23.9 \pm 3.47		0.14	0.9
Min-max	16-32		18-29			
Sex	N	%	N	%		
Male	10	66.7	11	73.3	Fisher's exact test	0.7 NS
Female	5	33.3	4	26.7		
ASA classification	N	%	N	%	X²	
I	9	60.0	9	60.0	0	1NS
II	6	40.0	6	40.0		
Medical history	N	%	N	%	X²	
NHMD	9	60.0	9	60.0	0	
Smoker	1	6.7	0	0.0	1	
Hypertension on ACE I	2	13.3	1	6.7	0.3	
Hypertension on B blocker	3	20.0	3	20.0	0	
DM on insulin	1	6.7	2	13.3	0.3	
DM on oral hypoglycemic	1	6.7	2	13.3	0.3	

Data were presented as mean \pm standard deviation (SD) and range (minimum to maximum). T-test: for comparing the mean between two different groups when data are normally distributed. X²: chi-square test. GroupA: preoperative regional scalp block, Group C: a control group with no block. NS: non-significant difference

Table 2: Fentanyl consumption and MAC of isoflurane used intraoperatively among studied two groups

	Group A (n=15)	Group C (n=15)	t-test	P-value
Fentanyl consumption intraoperatively (μg)				
Mean \pm SD	206.7 \pm 17.59	333.3 \pm 24.4	16.3	<0.001 HS
Min-max	200-250	300-350		
MAC of isoflurane used intraoperatively (%)				
Mean \pm SD	1.08 \pm 0.1	1.2 \pm 0.0	4.6	<0.001 HS
Min-max	1-1.2	1.2-1.2		

Data were presented as mean \pm standard deviation (SD) and range (minimum to maximum). T-test: for comparing mean among two groups when data are normally distributed. Group A: preoperative regional scalp block, Group C: a control group with no block. HS: Highly significant difference (P<0.001), μ g: microgram, n: number

Table 3: Visual analogue scale at different times among the studied groups

Visual analogue scale (VAS)	Group (n=15)		Group (n=15)		MW	P-value
At 30 min postoperative						
Mean \pm SD	1.07 \pm 0.25		2.5 \pm 2.07 ^a		24.5	0.02 S
Median	1		1.5			
Min-max	1-2		1-6			
	N	%	N	%		
Can't be assessed	0	0.0	9	60.0	—	—
At 1 hour postoperative						
Mean \pm SD	1.07 \pm 0.59		3.33 \pm 2.02		33.5	<0.001
Median	1		3			HS
Min-max	0-3		0-7			
At 2 hour postoperative						
Mean \pm SD	1.93 \pm 0.96		3.8 \pm 2.04		45	0.004
Median	2		3			
Min-max	1-4		1-8			
At 4 hour postoperative						
Mean \pm SD	3.47 \pm 1.25		5.2 \pm 1.56		43	0.004
Median	3		6			
Min-max	1-5		2-7			
At 8 hour postoperative						
Mean \pm SD	3.67 \pm 1.63		4.73 \pm 1.09		60	0.02
Median	4		5			
Min-max	1-7		2-7			
At 16 hour postoperative						
Mean \pm SD	2.87 \pm 1.06		3.67 \pm 1.18		63.5	0.03
Median	3		4			
Min-max	1-5		1-6			
At 24 hour postoperative						
Mean \pm SD	2.33 \pm 1.17		2.6 \pm 0.99		93	0.4
Median	2		3			
Min-max	1-5		1-4			

Data were presented as mean (M) \pm standard deviation (SD), median, range (minimum to maximum) Group A: preoperative regional scalp block, Group C: a control group with no block. Mann-Whitney (MW) test: of choice in a comparison between 2 groups when data not normally distributed. NS: non-significant difference ($p > 0.05$), S: significant difference ($p < 0.05$), HS: Highly significant difference ($P < 0.001$)

($p < 0.001$) in group A compared to group C (Table 4) and (Figure 5).

As regards total dose of postoperative Fentanyl (μg) consumption in the first 24 hours, it was highly statistically significantly less in group A compared to group C ($p < 0.001$) (Table 4).

DISCUSSION

A lot of noxious stimuli occur in craniotomy such as head pinning and result in major hemodynamic stress response. Attenuation of this resultant stress response is highly recommended neurosurgery. On

the other side, acute or prolonged hypotension associated with the use of opioids, inhalational or intravenous anaesthetics or other vasoactive drugs that attenuate the cardiovascular response to head pinning are unwanted. Regional scalp block is considered an easy and effective technique of blunting the cardiovascular response and results in reducing morbidity after craniotomy. The efficacy of many of local anaesthetics has been studied in many previous studies, including lidocaine and bupivacaine, in attenuating the intraoperative hemodynamic response to pain and optimizing postoperative analgesia. To the best of our knowledge,

Table 4: Time of the first request of rescue analgesia and total dose of post operative Fentanyl (μg) consumption in the first 24 hours among the studied two groups

Variables	Group A (n=15)	Group C (n=15)	Test	P-value
Time from extubation to the first request of analgesia (hours)				
Mean \pm SD	2.86 \pm 1.13	1.03 \pm 0.44	14 MW	<0.001 HS
median	2	1		
Min-max	1-4	0.5-2		
Total dose of postoperative Fentanyl (μg) consumption in the first 24 hours				
Mean \pm SD	286.7 \pm 51.6	540.0 \pm 57.3	t-test	<0.001
Min-max	200-400	450-650	12.7	HS

Data were presented as mean (M) \pm standard deviation (SD), median, range (minimum to maximum) Group A: preoperative regional scalp block, Group C: a control group with no block. Mann-Whitney (MW) test: of choice in the comparison between 2 groups when data not normally distributed, t-test: used to compare between 2 groups when data are normally distributed. HS: Highly significant difference(P<0.001)

however, no previous study has compared regional scalp block (RSB) with lidocaine/bupivacaine 1:1 mixture with 1/200000 epinephrine versus control group using conventional general anaesthesia with no block.

Our results suggest that there is a strong correlation between RSB and attenuation of stress response to surgery in addition to a reduction of post craniotomy pain.

A total of 30 adult patients who underwent an elective craniotomy to remove supratentorial masses were enrolled in the study and randomized into two groups; group A received regional scalp block (RSB) preoperatively after induction of general anaesthesia with endotracheal intubation and before skin incision as it was relatively painful manoeuvre and group C received conventional general anaesthesia with fentanyl without RSB. The two groups were compared regarding patient characteristics, medical history, intraoperative autonomic cardiovascular response to pain: heart rate and invasive blood pressure (mean arterial blood pressure), the total amount of fentanyl used intraoperatively, MAC of isoflurane used intraoperatively, postoperative pain score: using Visual Analogue Scale (VAS score), time from extubation to the first request of rescue analgesia, a total dose of postoperative Fentanyl (μg) consumption in the first 24 hours.

Lidocaine 2% and bupivacaine 0.5% 1:1mixture with epinephrine 1/200000 has been used in our study instead of lidocaine alone; that was used in the study conducted by Yang *et al.* (2019) to avoid the occurrence of local anaesthetic toxicity and prolong the duration of analgesia.

One of the crucial findings of our study was decreasing intraoperative hypertension and tachycardia in response to craniotomy. The MAP and HR were

higher in group C compared to group A during head pinning, during 1&3 min after head pinning, skin incision, 3 minutes after incision, during working with bone, skin closure and 10 minutes before extubation and this was attributed to the effect of scalp block; however, MAP and HR did not show a significant difference at baseline, induction, intubation, 3 minutes after intubation, 10 minutes after intubation, before head pinning as they received same anaesthetic technique, while MAP and HR did not show a significant difference at the dural opening, every 30 minutes intraoperatively after dural opening, dural closure and bone closure as it was relatively easy manoeuvres. These findings are in agreement with the results of Geze *et al.* (2009). They studied the effect of regional scalp block versus local scalp infiltration on the hemodynamic stress response to head pinning for craniotomy, where the study included 45 patients of ASA I or II class, planned for supratentorial craniotomies.

Bloomfield *et al.* (1998) results simulate our results, and they concluded that the use of 0.25% bupivacaine with epinephrine (1: 200 000) helped in attenuation of intraoperative cardiovascular response (MAP and HR) to pain at specific points. However, it was in contrast to our study, as it was not successful in blunting the immediate postoperative hemodynamic response. The difference in our study design was that we used a mixture of lidocaine 2% and bupivacaine 0.5% combined with adrenaline (1: 200 000) to perform scalp block instead of scalp infiltration at the beginning of surgery to help us cover the whole duration of surgery and the early postoperative period.

Moreover, our study was harmonious with the results of Pinosky *et al.* (1996) who studied the effect of skull block with bupivacaine 0.5% on the hemodynamic response in patients who underwent

craniotomy for removal of brain tumours necessitating the use of head pinning. The study demonstrated that regional scalp block with 0.5% bupivacaine was successful in blunting the hemodynamic stress response to head pinning. Moreover, it was found that no patients who received a skull block with bupivacaine needed any other manoeuvres to blunt the sympathetic response to head pinning. In contrast, nine of 10 patients without bupivacaine scalp block needed additional analgesia to control the cardiovascular response, and this was in agreement with our study.

Also, our results match that of the retrospective study performed by [Can and Bilgin \(2017\)](#) where patients who were given regional scalp block with levobupivacaine before skull pinning and scalp incision had good intraoperative hemodynamic stability compared to these patients not received the block. But it was different from our study in the choice of local anaesthetic used as they had used levobupivacaine.

Regarding the total amount of fentanyl (μg) & MAC of isoflurane used intraoperatively, we found that it was lower in group A compared to the group C, these results allowed early extubation and rapid regain of conscious level, thus allowing adequate and accurate assessment of patients in the early postoperative period. Our results match that of the retrospective study performed by [Can and Bilgin \(2017\)](#) where patients who received regional scalp block with levobupivacaine before skull pinning and scalp incision were compared with control regarding anaesthesia/analgesia requirements, and they reported that regional scalp block resulted in a reduction in the required doses of anaesthetics and opioids. But their patients had used levobupivacaine as a local anaesthetic.

Concerning the severity of post craniotomy pain, however, the ideal analgesic for post craniotomy pain is not yet available. With talking about Visual Analogue Scale (VAS score), it was higher in group C compared to group A at all the times of assessment except at 24 h where there was no difference among the two studied groups as the effect of the block had been wholly vanished in group A. In addition to that, VAS could not be assessed in more than half of patients in group C. In contrast, all of the patients in group A were fully conscious at 30 minutes postoperative this was due to lower consumption of fentanyl and lower MAC of isoflurane used intraoperatively. Moreover, VAS score was slightly higher in group C compared to group A at 8h and 16h due to residual effect of the block and the used preemptive analgesia (RSB) in group A, in contrast to initially

high VAS in group C that depended upon multimodal analgesia alone without RSB.

Our results were in agreement with the results of [Nguyen et al. \(2001\)](#). His study included 30 patients randomly distributed to perform regional scalp block using ropivacaine or normal saline. Pain score was assessed in the first postoperative 48 hours and was found to be lower in ropivacaine infiltration group. Also, postoperative analgesia time was noticed to be longer than the predicted half-life of ropivacaine (three to four hours). Moreover, pain scores in the ropivacaine groups were noticed to be significantly lower than the saline group for up to 24 hours, and the postoperative analgesic duration seemed to last for more than 48 hours. The authors attributed this unpredicted long-lasting pain relief than usual to pre-emptive analgesia. We observed that phenomenon in our study but the analgesic effect lasted up to 16 h in some cases. Also, it might be attributed to the multimodal analgesic strategy used. [Bala et al. \(2006\)](#) studied cases that performed a supratentorial craniotomy and randomized to perform regional scalp block using bupivacaine or placebo after the end of skin closure, and the rescue analgesic given was either intramuscular diclofenac or intravenous tramadol. It was also noticed that the patients who did not perform regional scalp block suffered more frequently from moderate to severe pain and thereby needed more rescue medications; after six h postoperatively.

In the view of time from extubation to the first request of rescue analgesia and total dose of systemic Fentanyl (μg) consumption in the first 24 hours, it was longer in group A compared to group C. due to the effect of the block. Our results were in concordance with the study conducted by [Yang et al. \(2019\)](#) in a study that included Fifty-seven patients who were planned for craniotomy for surgical clipping of a cerebral aneurysm. Patients were randomly distributed into three groups: Group S (SNB was performed with 15 mL of 0.75% ropivacaine), group I (LA with 15 mL of 0.75% ropivacaine) and group C (that only received routine intravenous analgesia). Group S reported less post craniotomy pain, more extended time before the first rescue dose of oxycodone, less consumption of oxycodone and lower incidence of PONV through 48 h postoperatively than Groups I and C. but in contrary to our study. The local anaesthetic used was ropivacaine instead of lidocaine/bupivacaine mixture in our study, and oxycodone was used instead of fentanyl used in our study.

CONCLUSIONS

The present study showed that preoperative regional scalp block (RSB) with lidocaine 2% bupivacaine 0.5% mixture 1:1 with epinephrine 1/200000 (group A) stabilized the intraoperative haemodynamics during supratentorial craniotomy by blunting the sympathetic responses to surgical stimulation in the form of hypertension and tachycardia, so facilitated hypotensive anaesthesia thus allowed bloodless surgical field, better surgical resection of brain tumours and so resulted in better surgical outcomes and minimized the need for blood transfusion. Moreover, it had decreased consumption of opioids and inhalational anaesthetics intraoperatively compared to conventional general anaesthesia with IV fentanyl without RSB (group C). In addition to that, it had decreased the severity of pain in the early postoperative period and reduced consumption of opioids in the first 24 hours postoperative so hastened patients recovery with less postoperative sedation so allowed adequate early precise postoperative neurological assessment.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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