PROSPECTIVE, RANDOMIZED STUDY TO ASSESS THE ROLE OF DEXMEDETOMIDINE IN PATIENTS WITH SUPRATENTORIAL TUMORS UNDERGOING CRANIOTOMY UNDER GENERAL ANAESTHESIA

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Abstract

Background: Preliminary data on the perioperative use of dexmedetomidine in patients undergoing craniotomy for brain tumor under general anaesthesia indicate that the intraoperative administration of dexmedetomidine is opioid-sparing, results in less need for antihypertensive medication, and may offer greater hemodynamic stability at incision and emergence. Dexmedetomidine, α 2 adrenoceptor agonist used as adjuvant to anaesthetic agents. Relatively recent studies have shown that dexmedetomidine is able to decrease circulating plasma norepinephrine and epinephrine concentration in approximately 50%, decreases brain blood flow by directly acting on post-synaptic α 2 receptors, decreases CSF pressure without ischemic suffering and effectively decrease brain metabolism and intracranial pressure and also, able to decrease injury caused by focal ischemia.

Purpose: This prospective, randomized, double-blind study was designed to assess the perioperative effect of intraoperative infusion of dexmedetomidine in patients with supratentorial tumors undergoing craniotomy under general anaesthesia.

Methods: Forty patients with CT- scanning proof of supratentorial tumors. The patients were classified equally into 2 groups (twenty patients in each group). Group **A: -** The dexmedetomidine was given as a bolus dose of 1 μg/kg in 20 minutes before induction of anaesthesia, followed by a maintenance infusion of 0.4 μg/kg/hr. The infusion was discontinued when surgery ended. Group **B: -** The patients received similar volumes of saline.

Results: The heart rate and mean arterial blood pressure, decreased in patients of group A (dexmedetomidine group) more than group B (placebo group) with significant statistical difference between the two groups (P-value <0.05). No significant statistical difference between the two groups regarding the central venous pressure and arterial partial pressure of Carbon Dioxide (P-value >0.05). The intraoperative end-tidal sevoflurane (%) in patients of group A less than in patients of group B (P-value <0.05).The intracranial pressure decreased in patients of Group A more than group B (P-value <0.05). The Glasgow coma scale (GCS) improved in patients of group A and deteriorated in patients of Group B with significant statistical difference between the two groups (P-value <0.05).The Total fentanyl requirements from induction to extubation of patients

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increased in patients of group B more than in patients of group A (P-value <0.05). The total postoperative patients' requirements for antiemetic drugs within the 2 hours after extubation decreased in patients of group A more than group B (P-value <0.05). The postoperative duration from the end of surgery to extubation decreased significantly in patients of group A more than group B (P-value <0.05). The total urine output during the duration from drug administration to extubation of patients increased in patients of group A more than group B (P-value <0.05).

Conclusions: Continuous intraoperative infusion of dexmedetomidine during craniotomy for supratentorial tumors under genera-l anaesthesia maintained the haemodynamic stability, reduced sevoflurane and fentanyl requirements, decreased intracranial pressure, and improved significantly the outcomes.

Key words: Dexmedetomidine - supratentorial Tumors - Craniotomy – Sevoflurane – Fentanyl - Intracranial pressure - Neurosurgical intensive care unit.

Introduction

The intense surgical stimuli associated with craniotomy frequently engender sympathetic activation and marked changes in systemic arterial pressure, CBF, and ICP. Cerebrovascular responses may result in elevated ICP and reduction in cerebral perfusion pressure, especially in patients with impaired autoregulation and compromised cerebral compliance. Perioperative hypertension in neurosurgical patients is associated with intracranial bleeding and prolonged hospital stay[1]. Thus, the prevention and control of the hemodynamic response to nociceptive stimuli are of utmost importance to preserve cerebral homeostasis in neurosurgical patients. The antinociceptive, sympatholytic, and anaesthesia-sparing effects of α 2-agonists are well documented[2,3]. This spectrum of properties would be consistent with the important goals during neurosurgical anesthesia of intraoperative hemodynamic stability and modulation of intraoperative sympathetic responses to attenuate cerebrovascular and myocardial risks and avoid intracranial hemorrhage, and to allow immediate neurological evaluation upon emergence[4-6].

Alpha-2-Adrenoreceptors are a subgroup of noradrenergic receptors distributed broadly within and outside the CNS. Alpha-2-Receptors in the brain are concentrated primarily in the pons and medulla, areas involved in transmitting sympathetic nervous system activation from higher brain centers to the periphery. Stimulation of presynaptic α 2-receptors reduces norepinephrine release, and activation of postsynaptic α 2-receptors hyper-polarizes neural membranes. Interaction between these receptors and norepinephrine thus acts as an inhibitory feedback loop in which excessive norepinephrine release actually reduces further release of the same neurotransmitter[7,8]. In the spinal cord, α 2-adrenergic receptors are located postsynaptically in the dorsal horn, and their stimulation inhibits nociceptive signal transmission[9]. In the periphery, α 2-receptors are found on vascular smooth muscle, in which their activation results in vasoconstriction[8]. Injectable dexmedetomidine was approved by the FDA in 1999 for use in the intensive care unit. Since its approval and clinical use, it has been utilized for sedation during surgery and postoperative periods[10]. **D**exmedetomidine (DEX) is a highly selective α 2-adrenoreceptor agonist recently introduced to anaesthesia practice. It produces dose-dependent sedation, anxiolysis, and analgesia (involving spinal and supraspinal sites) without respiratory depression[3,11]. DEX enhances anaesthesia produced by other anaesthetic drugs and decreases blood pressure by stimulating central alpha2 and imidazoline receptors[12,13]. The use of DEX in neuroanaesthesia generate a reduction in the sympathetic tone and a decrease in peripheral noradrenaline release reducing hypertensive responses to neurosurgical patient stimulation during catheterization and head pin holder application[14,15]**.** The aim of our study to assess the perioperative effect of dexmedetomidine in patients with supratentorial brain tumors undergoing craniotomy under general anaesthesia.

Patients and methods

After obtaining informed consent and approval of local ethics and research committee, forty patients in Kasr El-Aini hospital, Cairo University with CT-scanning proof of supratentorial brain tumor were

scheduled for craniotomy under general anaesthesia. The exclusion criteria were as follows: pregnant or nursing woman, morbid obesity, preoperative heart rate <45 beats/min, second or third degree AV block, antihypertensive medication with a-methyldopa, clonidine or other α 2-adrenergic agonist during the 28 days before scheduled study, EF <30% sleep problems, psychiatric diseases and renal or hepatic diseases. The surgery in all patients of both groups was elective.

On arrival to operating room and under local anaesthesia, the central venous line was inserted in subclavian vein, left radial arterial cannulation was done and the intracranial pressure (ICP) was monitored by ventriculostomy catheter placed by the neurosurgeon through a burr hole into the lateral ventricle of the brain, preoperatively under local anaesthesia. Electronic monitoring of ICP was done by utilizing saline-filled tubing with a pressure transducer. The transducer should be zeroed as the same for arterial pressure (at the external auditory meatus) before induction of anaesthesia. The patients were randomized into 2 groups (twenty patients in each group). Group A**;** The dexmedetomidine group (The dexmedetomidine was supplied in 2-mL ampoules of 100 µg/ml concentration (Abbott, Chicago, IL, USA), and this volume was diluted with 98 mL of normal saline to yield a final concentration of 2 µg/ml), the patients were premedicated with dexmedetomidine (1 µg/kg) in 20 minutes followed by a maintenance infusion of 0.4 µg/kg/hr. The infusion was discontinued when surgery ended. Group B; The placebo group, the patients were received similar volumes of saline. All patients should be preoxygenated, and then intravenous thiopental (3-5mg/kg) followed by fentanyl (3-5µg/kg) and atracurium 0.5 mg/kg as a bolus dose over 30 sec, while controlled hyperventilation with 100% oxygen was instituted. Before intubation an additional bolus of thiopental (2-3 mg/kg) was given. After induction, controlled mechanical ventilation was adjusted to maintain $PaCO_2$ between 30 and 35 mmHg. The anaesthesia was maintained with sevoflurane 0.5 to 3%, atracurium was administered by intravenous infusion at a rate of 0.5 mg/kg/hr and fentanyl infusion (1 µg/kg/hr). Bolus doses of fentanyl (1-2 µg/kg) were given to control the increased heart rate and systemic hypertension during surgery according to the need. Fluid resuscitation and maintenance fluids were provided with glucose free iso-osmolar crystalloid solutions 2-3 ml/kg/hr, and replacement of blood loss and urine output. Drugs such as corticosteroids, diuretics (1-2 mg/kg) and mannitol (1gm/kg) were given according to the need. The monitors used during anaesthesia included ECG, Pulse oximetry, non invasive blood pressure, invasive blood pressure from left radial artery cannula, continuously core temperature from nasopharyngeal probe, central venous pressure from subclavian vein, end tidal CO2, end-tidal concentration of sevoflurane, urine output from urinary catheter every one hour, intracranial pressure (ICP) and arterial blood gases (ABG were done by AVL GRAZ OMNI 6 Modular system). Neurological assessment was done for all patients by Glasgow coma scale before induction of anaesthesia and after 2 hours of extubation. At the end of surgery, all patients were transferred to neurosurgical intensive care unit and monitored by the same monitors used intraoperatively. The data of patients was collected at the following timepoints, T0: The reading before administration of the study medication, T1: The reading after induction of anaesthesia, T2: The reading 2 hours after administration of study medication, T3: The reading at the of end surgery, T4: The reading on admission to the ICU, T5: The reading before extubation and T6: The reading 2 hours after extubation.

The Statistical Paragraph in Material and Methods

Data were statistically described in terms of range; mean ± standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) when appropriate. Comparison of quantitative variables between the study groups was done using Mann Whitney *U* test for independent samples. For comparing categorical data, Chi square (χ^2) test was performed. Exact test was used in stead when the expected frequency is less than 5. A probability value (*p* value) less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs Microsoft Excel version 7 (Microsoft Corporation, NY, USA) and SPSS (Statistical Package for the Social

Science; SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

Results

There were no significant statistical differences regarding the demographic data of patients (table 1). The types of supratentorial brain tumors in patients were similar as in (table 1).The heart rate (table 2 and fig. 1) and mean arterial blood pressure (table 3 and fig. 2) decreased in patients of group A more than in patients of group B with significant statistical difference between the two groups (P<0.05). Two patients of group A and Three patients of group B were received incremental doses of atropine(0.5 mg) and ephedrine (5 mg) as the heart rate decreased below 50 bpm and the mean arterial blood pressure decreased below 60mmHg (table 4). One patients of group A and four patients of group B were associated with elevated heart rate and mean arterial blood pressure and controlled by incremental doses of fentanyl and esmolol in addition to nitroglycerine infusion after opening of the dura matter (table 4). The central venous pressure decreased in patients of both groups, but there was no significant statistical difference between the two groups (table 5and figure 3). There was no significant statistical difference between the two groups regarding the arterial partial pressure of Carbon Dioxide (table 6 and fig. 4). The intracranial pressure decreased in patients of group A more than group B with significant statistical difference between the two groups (table 7 and fig. 5). The Glasgow coma scale (GCS) improved in patients of group A and deteriorated in patients of group B with significant statistical difference (P<0.05) between the two groups (table 8 and fig. 6). During extubation the conscious level was not fine in one patient of group A and four patients of group B. There was no significant statistical difference between the two groups regarding duration of the surgical procedures. Regarding the end-tidal sevoflurane % (table 9), there was significant statistical difference between the two groups (P<0.05). The total fentanyl requirements from induction to extubation of patients increased in patients of group B to control the elevated heart rate and arterial blood pressure more than in patients of group A with significant statistical difference (P<0.05) between the two groups (table 9). The total postoperative patients requirements for antiemetic drugs (metoclopramide and ondansetron) within the 2 hours after extubation decreased in patients of group A more than group B with significant statistical difference (P<0.05) between the two groups (table 89). The postoperative duration from the end of surgery to extubation (table 9) decreased significantly in patients of group A more than group B with significant statistical difference between the two groups (P-value <0.05). The total urine output during the duration from drug administration to extubation of patients increased in patients of group A more than group B with significant statistical difference between the two groups (table 9).

Table 1

Demographic data and types of supratentorial brain tumors in patients. Values are expressed as mean (SD) or %

Item	Group A *(n= 20)*	Group B *(n= 20)*	P-value
Age (year)	47.10 (13.345)	44.00 (14.220)	0.579
Weight (kg)	82.10 (11.229)	82.80 (12.007)	0.912
Sex (Male/Female)	9/11	12/8	
Glioma	40	30	
Meningioma	40	45	
Astrocytoma	20	25	

Group A: Dexmedetomidine group and Group B: Placebo group.

Table 2

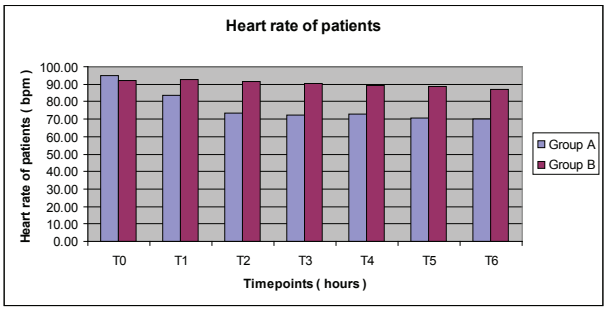
Heart rate (bpm) in patients. Values are expressed as mean (SD)

Item	Group A *(n = 20)*	Group B *(n = 20)*	P-value
T0	94.90 (6.887)	91.90 (5.859)	0.315
T1	83.80 (5.453)†	92.80 (2.616)+	0.001*
T2	73.60 (3.893)†	91.50 (4.116)+	0.000*
T3	73.40 (3.777)†	90.60 (5.016)+	0.000*
T4	73.40 (3.098)†	90.30 (4.228)+	0.000*
T5	73.60 (2.797)†	89.10 (5.493)+	0.000*
T6	73.20 (2.530)†	88.80 (6.494)+	0.000*

Group A: Dexmedetomidine group and Group B: Placebo group.
T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU.T5: The reading before extubation. T6: The reading 2 hours after extubation.
***** Statistically significant (P-value < 0.05) Group A versus Group B.
† P<0.0.05 versus baseline.
+ Statistically insignificant (P-value >0.05).

Fig. 1

The heart rate of patients in the two groups



T0: baseline, T1: after induction, T2: 2 hours after administration of study medication, T3: at the end of surgery, T4: on admission to the ICU, T5: before extubation and T6: 2 hours after extubation. Group A: Dexmedetomidine group and Group B: Control group.

Table 3

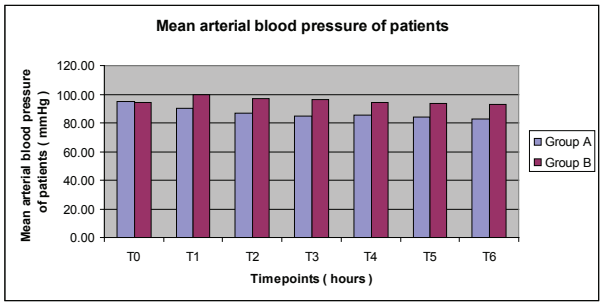
Mean arterial blood pressure (mmHg) of patients. Values are expressed as mean (SD)

Item	Group A *(n = 20)*	Group B *(n = 20)*	P-value
T0	94.70 (8.957)	93.90 (8.863)	0.739
T1	90.30 (8.795)	99.70 (7.790)	0.019*
T2	86.90 (7.564)†	96.80 (5.692)+	0.003*
T3	85.00 (6.549)†	96.10 (5.195)+	0.001*
T4	85.30 (5.889)†	94.00 (4.137)+	0.002*
T5	84.00 (6.037)†	84.00 (6.037)†	0.000*
T6	83.00 (4.243)†	92.60 (3.950)+	0.000*

Group A: Dexmedetomidine group and Group B: Placebo group.
T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU.T5: The reading before extubation. T6: The reading 2 hours after extubation.
***** Statistically significant (P-value < 0.05) Group A versus Group B.
† P<0.0.05 versus baseline.
+ Statistically insignificant (P-value >0.05).

Fig. 2

The mean arterial blood pressure (mmHg) of patients in the two groups



T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU. T5: The reading before extubation. T6: The reading 2 hours after extubation.
Group A: Dexmedetomidine group and Group B: Placebo group.

Table 5

Central venous pressure (mmHg) of patients. Values are expressed as mean (SD)

Item	Group A *(n = 20)*	Group B *(n = 20)*	P-value
T0	13.00 (1.155)	13.10 (1.197)	0.853
T1	12.40 (0.966)	1 2.50 (1.080)	0.796+
T2	9.90 (0.876)	10.30 (1.160)	0.481+
T3	9.00 (0.812)	9.80 (0.919)	0.075+
T4	8.80 (0.915)	9.60 (0.966)	0.105+
T5	9.50 (0.962)	9.30 (0.823)	0.684+
T6	9.00 (0.972)	9.00 (0.816)	1.000+

Group A: Dexmedetomidine group and Group B: Placebo group.
T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU.T5: The reading before extubation. T6: The reading 2 hours after extubation.
+ Statistically insignificant (P-value >0.05).

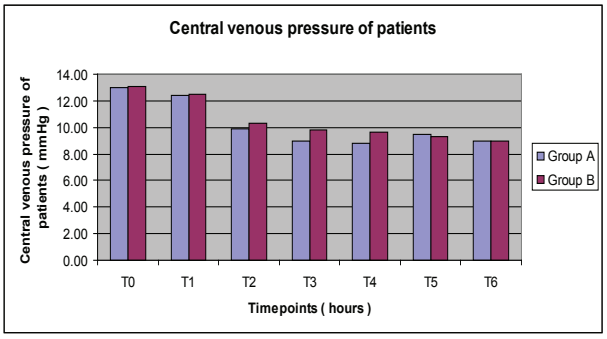
Table 4

Intraoperative drugs for haemodynamic disturbances

Item	Group A *(n = 20)*	Group B *(n = 20)*	Management
HR<50bpm	2 patients	3 patients	Atropine 0.5 mg (Incremental doses)
MAP<60 mmHg	2 patients	3 patients	Ephedrine 5-10mg (Incremental doses)
HR>100bpm	1 patients	4 patients	- Esmolol 0.mg/kg (Incremental doses) or infusion 50-200 μg /kg/ min if needed
			- Fentanyl 50-100μg(Incremental doses)
MAP>100 mmHg	1 patients	4 patients	- Nitroglycerine0/5-10 μg /kg/min after opening of dura matter or - Fentanyl 50-100μg(Incremental doses)

Group A: Dexmedetomidine group and Group B: Placebo group.
HR**:** Heart rate MAP**:** mean arterial blood pressure.

Fig. 3
The central venous pressure (mmHg) of patients in the two groups



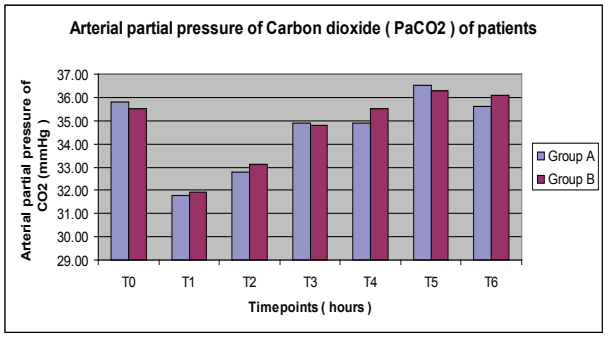
T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU. T5: The reading before extubation. T6: The reading 2 hours after extubation.
Group A: Dexmedetomidine group and Group B: Placebo group.

Table 6
Arterial partial Pressure of Carbon Dioxide P_aCO_2 (mmHg) of patients. Values are expressed as mean (SD)

Item	Group A *(n = 20)*	Group B *(n = 20)*	P-value
T0	35.80 (3.910)	35.50 (3.894)	0.315
T1	31.80 (1.687)	31.90 (1.595)	0.143+
T2	32.80 (1.676)	33.10 (1.197)	0.089+
T3	34.90 (1.197)	34.80 (0.789)	0.912+
T4	34.90 (2.601)	35.50 (1.354)	0.529+
T5	36.50 (0.994)	36.30 (1.160)	0.579+
T6	35.60 (1.265)	36.10 (1.663)	0.435+

Group A = Dexmedetomidine group and Group B = Control group.
T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU.T5: The reading before extubation. T6: The reading 2 hours after extubation.
+ Statistically insignificant (P-value >0.05).

Fig. 4
The arterial partial Pressure of Carbon Dioxide P_aCO_2 (mmHg) of patients in the two groups



T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication. T3: The reading at the end of surgery. T4: The reading on admission to the ICU. T5: The reading before extubation. T6: The reading 2 hours after extubation.
Group A: Dexmedetomidine group and Group B: Placebo group.

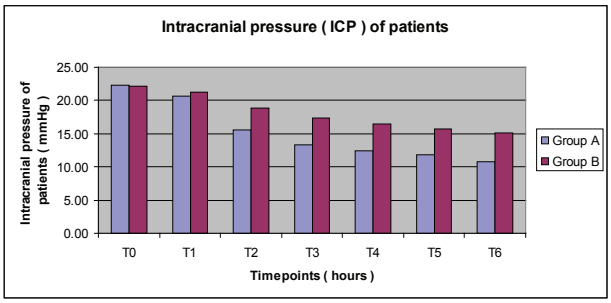
Table 7
Intracranial pressure (mmHg) of patients. Values are expressed as mean (SD)

Item	Group A *(n = 20)*	Group B *(n = 20)*	P-value
T0	22.30 (3.057)	22.10 (2.807)	0.739
T1	20.70 (2.669)	21.20 (2.300)	0.019
T2	15.60 (1.578)†	18.90 (1.792)	0.003*
T3	13.30 (1.636)†	17.30 (1.767)	0.001*
T4	12.40 (1.265)†	16.40 (1.897)†	0.002*
T5	11.80 (0.919)†	15.70 (1.636)†	0.000*
T6	10.80 (1.135)†	15.10 (1.792)†	0.000*

Group A: Dexmedetomidine group and Group B: Placebo group.
T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU. T5: The reading before extubation. T6: The reading 2 hours after extubation.
+ Statistically insignificant (P-value >0.05).
***** Statistically significant (P-value <0.05) Group A versus Group B.
† P<0.0.05 versus baseline.

Fig. 5

The intracranial pressure (mmHg) of patients in the two groups



T0: The reading before administration of the study medication. T1: The reading after induction of anaesthesia. T2: The reading 2 hours after administration of study medication.T3: The reading at the end of surgery.T4: The reading on admission to the ICU. T5: The reading before extubation. T6: The reading 2 hours after extubation.

Group A: Dexmedetomidine group and Group B: Placebo group.

Table 8

Glasgow coma scale (GCS) of patients. Values are expressed as mean (SD)

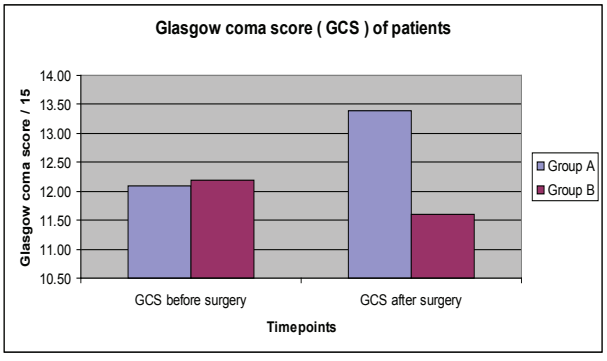
Timepoints	Group A *(n = 20)*	Group B *(n = 20)*	P-value
T0	12.10 (1.69)	12.20 (1.73)	1.000
T6	13.40 (1.31)	11.60 (1.34)	0.011*

Group A: Dexmedetomidine group and Group B: Placebo group. T0: Glasgow coma scale before administration of the study medication and T6**:** Glasgow coma scale 2 hours after extubation.

***** Statistically significant (P-value <0.05) Group A versus Group B.

Fig. 6

Glasgow coma scale (GCS) of patients in the two groups



T0**:** Glasgow coma scale before administration of the study medication and T6: Glasgow coma scale 2 hours after extubation. Group A: Dexmedetomidine group and Group B: Placebo group.

Table 9

Intraoperative and postoperative data. Values are expressed as mean (SD) or %

Item	Group A *(n = 20)*	Group B *(n = 20)*	P-value
Surgical duration (min)	239.3 (79.25)	236.1 (82.51)	0.1+
End-tidal sevoflurane (%)	1.18 (0.209)	2.18 (0.477)	0.001*
Total fentanyl doses (μg)	440.00 (42.164)	602.00 (72.847)	0.000*
Patients' metoclopramide requirement %	50.0%	100.0%	0.016*
Patients' ondansetron requirement %	30.0%	80.0%	0.035*
Duration before extubation (min)	41.40 (6.310)	87.00 (16.533)	0.001*
Total fentanyl doses	440.00 (42.164)	602.00 (72.847)	0.000*

Group A: Dexmedetomidine group and Group B: Placebo group.

***** Statistically significant (P-value <0.05) Group A versus Group B.

+ Statistically insignificant (P-value >0.05).

Discussion

The concept of neuroanaesthesia includes several principles, the haemodynamic stability perioperatively being one of utmost importance. During surgery, abrupt increases in arterial blood pressure may cause bleeding or edema in the operating field. Low arterial pressures on the other hand predispose the patients to cerebral ischaemia, because autoregulation of the cerebral blood flow (CBF) is often impaired near tumors or traumatized areas[1]. High concentrations of volatile anaesthetics can blunt the carbon dioxide response and render CBF pressure passively[16]. The haemodynamic responses to intracranial surgery are most often elicited at the beginning or the end of the procedure. Similarly, the manipulation of certain structures within the brain may produce cardiovascular changes. After surgery, hypertension may predispose the patient to postoperative intracranial haematoma[1].

Dexmedetomidine is a highly selective α2-agonist that has been shown to have sedative, analgesic and anaesthetic sparing effects[17-22].

We investigated the effects of dexmedetomidine in neurosurgical patients in an attempt to find a clinically feasible combination of anaesthetics that

would ensure perioperative haemodynamic stability and fast recovery without respiratory depression. Such combination would reduce the required volatile anaesthetics, narcotics, sedatives and decrease the risk of affecting cerebral autoregulation.

The present study showed that the dexmedetomidine significantly attenuated the haemodynamic responses to laryngoscopy, intubation, Mayfield three-pin head holder application surgical stimulation and extubation in patients undergoing supratentorial surgery and to control the haemodynamic responses in patients of the control group, higher doses of sevoflurane, fentanyl and esmolol were used before opening of the dura in addition to nitroglycerine after opening of the dura. In some earlier studies, oral clonidine (Alpha2-agent) premedication provided attenuation of the hypertensive response to laryngoscopy, intubation and head holder application in patients undergoing supratentorial surgery[23,24]. In patients undergoing general or gynaecological surgery, numerous studies have shown that dexmedetomidine blunts the cardiovascular responses to intubation[25-27]. Other studies shown that the haemodynamic responses to emergence from anaesthesia and extubation are blunted with dexmedetomidine[28,29], and the centrally mediated sympatholytic effect has continued well into the postoperative period[28].

The intracranial pressure decreased significantly with dexmedetomidine group than in patients of the control group as the concentration of sevoflurane decreased and urine output increased in spite of fixed doses of diuretics. Many studies were done by to evaluate the effect of dexmedetomidine on the intracranial pressure and concluded that the dexmedetomidine decreased the intracranial pressure by the inhibition of the hypercapnic cerebral vasodilation[30], and its potent venous vasoconstriction[31]. The extubation was happened more quickly in patient of group A and was statistically significant in comparison to the patients in the group B. It may, however, reflect the lack of respiratory depression of dexmedetomidine and the uses of low doses of sevoflurane and fentanyl[32]. Dexmedetomidine has been shown to have minimal effects on respiration[33,34], and ventilatory weaning and tracheal extubation has been successfully carried out in critically ill patients under continuing dexmedetomidine sedation[35].

The dose of fentanyl decreased significantly in group A in comparison to group B. A study done by Arain SR et al and Venn RM, et al who concluded that dexmedetomidine has been shown to consistently reduce opioid requirements by 30 to 50%[36,37].

The requirement for antiemetic drugs decreased in the group A as the doses of fentanyl and sevoflurane were decreased in comparison to the group B or due to the decreased intracranial pressure. A study done by Scott F et al involving patients undergoing abdominal hysterectomy and concluded that postoperative nausea was reduced by 77.5% when dexmedetomidine was employed as an intraoperative anesthetic adjuvant[38].

The amount of urine increased significantly in group A and this one of the factors that leads to decrease in the ICP. Many studies were done and showed that the dexmedetomidine seems to induce diuresis by ability to reduce efferent sympathetic outflow of the renal nerve[39], in addition, dexmedetomidine has been shown to suppress antidiuretic hormone, with a resulting diuretic effect[40], and finally, dexmedetomidine increases secretion of atrial natriuretic peptide, resulting in natriuresis[41].

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All anesthetists have the authority to read the paper.

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