

COMPARISON OF PROPOFOL/DEXMEDETOMIDINE FOR ASLEEP AWAKE ASLEEP TECHNIQUE FOR AWAKE CRANIOTOMIES IN TERTIARY CARE HOSPITAL

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ABSTRACT

BACKGROUND

Awake craniotomy is an important technique used for brain tumour excision from eloquent cortex, epilepsy foci removal surgery, deep brain stimulation, less commonly for mycotic aneurysms, A-V malformation near cortical areas.

Aims and Objectives- To access quality of brain mapping, haemodynamic stability, perioperative airway security, & observation of adverse effects in propofol, dexmedetomidine groups for awake craniotomies.

Group Allocation- (Maintenance of anaesthesia in both groups was different as follows :)

Group A (Propofol Group): inj. propofol 6 mg/kg/hour for 10 min, then 4 mg/kg/hour. (n=25)

Group B (Dexmedetomidine group): Inj. dexmedetomidine 0.5 mg/kg/hour (n=25).

MATERIALS & METHODS

This randomised double-blind comparative study of premedication- Inj. glycopyrrolate 0.04 mg/kg, inj. ondansetron 0.08 mg/kg & in fentanyl 1 mcg/kg. Scalp block: scalp block was given with inj. Ropivacaine 0.5% 30 ml to block supraorbital, supratrochlear, zygomatic temporal, auriculotemporal nerves, greater auricular, lesser auricular nerves in General Hospital, NHLM medical college, Ahmedabad, Gujarat, India.

Induction- Induction was done with inj. thiopentone 5 to 7 mg/kg IV.

Airway security- By i-gel (second generation laryngeal mask airway)

Maintenance-

In group A: inj. propofol 6 mg/kg/hour for first 10 min then 4 mg/kg/hour

In group B: inj. dexmedetomidine 1 mcg/kg/hour for first 10 min then 0.5 mcg/kg/hour

When neurosurgeon wanted to perform brain mapping, patient's i-gel was removed & patients were managed with low dose of propofol & dexmedetomidine in awake period, then further dose was increased in 3rd phase, that is asleep period.

RESULTS

NRS score of cortical mapping was comparable in both groups-

- In both groups haemodynamic variables were stable & comparable.
- In group B better airway management & less complications observed.

CONCLUSION

In AAA method for awake craniotomies, use of dexmedetomidine is a good alternative to propofol.

KEYWORDS

Awake Craniotomy, AAA Method, Dexmedetomidine, Propofol, i-gel, Scalp Block.

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BACKGROUND

Awake craniotomy is popular since 2 decades. It is usually performed for epilepsy surgery, temporal lobectomy, which encroaches eloquent cortex, motor, speech areas, Deep brain stimulation, for AV malformation which needs intraoperative

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functional testing, Cortical mapping, which requires patient to be awake.^(1,2) Main advantage of awake surgery is to define limits of resection & avoid Postoperative neurological deficits.

Maintaining patient's cooperation by provision of optimal analgesia, sedation, anxiolysis and comfortable position, achieving homeostasis with safe airway, adequate ventilation and hemodynamic stability, Ensure minimal interference with electrocortico graphic recording during mapping.

Main Objective of the study was to access Brain mapping by NRS scale, Haemodynamic Stability, & adverse effects with both study drugs dexmedetomidine or propofol.

MATERIALS AND METHODS

This Randomised double-blind comparative study of 50 adult elective patients with mass near the eloquent area with ASA

grade I & II, Age group 18 to 60 years were selected for awake craniotomy. Patients were informed in detail about procedure. Proper counselling of each patient was done VS hospital, NHLM medical college, Ahmedabad, Gujarat, India

Preoperative Assessment

Through preoperative assessment & psychological counselling was done day before surgery.

Group A	Propofol -10 mg/kg/hour for first 10 mins & then 4 mg/kg/hour
Group B	Dexmedetomidine-/kg/hour for first 10 mins and then 0.5/mg/kg/hour

Group Allocation

Group Allocation was done by using Randomisation table.⁽³⁾

Allocation concealment done by sealed opaque envelope. Envelope was opened just before General Anaesthesia administration to the patient.

Sample Size

The sample size for the study was taken for convenience.

Premedication

It was given in form of Inj. Glycopyrrolate 0.04 mg/kg, Inj. Ondansetron 0.08 mg/kg, and Inj. Fentanyl were given Intravenously.

Benzodiazepine premedication was avoided because of its residual sedative and amnesic effects during intra operative assessment phase.

Pre-Oxygenation

O2 mask was applied with O₂ flow 4 L/min. Urinary catheter was inserted for patients comfort for long operative procedure and for diuretic administration. INJ. Cefazolin 1 gm was given for infection prophylaxis.

Scalp Block

It was given by using Ropivacaine 0.5 %.30 ml (max.) to block supraorbital, supratrochlear, zygomaticotemporal, Auriculotemporal, greater & lesser occipital, greater auricular nerves for better analgesia & perioperative Haemodynamic stability. Patients were managed by ASLEEP AWAKE ASLEEP technique in following manner.

Induction

Patients were induced by Inj. thiopentone 5 to 7 mg/kg intravenously.

Airway Security

After induction, 2nd generation LMA (i-gel) of appropriate size was inserted, cuff inflated, bilateral air entry checked and after confirming air entry i-gel was fixed.

Mode of Ventilation

1. Patients were put on spontaneous plus assistance mode on ventilator Of Dragger Fabius GS work station
2. With i-gel EtCO₂ sample line was attached to monitor EtCO₂ intra operatively.

Patients were maintained by (A sleep Period)

By i-gel O₂ (2 L/min) + N₂O (2 L/min) + Sevoflurane (0.5-2%) was started.

Maintenance was Different in Both Groups-

- **In-Group A** - Propofol infusion was started with loading dose of 6 mg/kg/hour over 10 min, followed by 4 mg/kg/hour
- **In Group B** - Dexmedetomidine infusion was started with loading dose of/kg over 10 min. followed by 0.5 mcg/kg/hour.

Position

Patients were positioned in Right or Left Lateral position according to site of lesion in Sujita frame.

Sniffing position was achieved to help facilitate and patent airway. A tent was made under the drape to allow direct communication with patients when mapping was done & they were awake.

Intra Operative Period: (Awake Period)

After position, operation was started, perioperative Haemodynamic, respiratory, EtCO₂, , SpO₂ monitoring done periodically with interval of 15 mins and surgeons were told to inform 15 min before the craniotomy was expected to over, all inhalational agents were stopped in both groups, i-gel was removed and nasal prongs applied for oxygenation. At the end of prongs ETCO₂ line (Side arm) was attached. In awake phase patients were oxygenated by nasal prongs. Sedation was managed in following ways: During awake phase patients were managed in different ways.

- In Group A (Propofol group) infusion was decreased to 2 mg/kg/ hour.
- In Group B (Dexmedetomidine group), it was decreased to 0.3 mcg/kg/hr.

In both groups, within 15 minutes after stopping inhalation agent patients were awake, conscious, and comfortable, i-gel was removed & nasal prongs were applied for oxygenation. Patients were put on nasal prongs with O₂ flow rate of 3 l/min.

Perioperative Haemodynamic respiratory variables noted periodically in form of HR, Mean Arterial pressure (MAP), SPO₂, ETCO₂.

Peroperative awareness was assessed by PRST score (Pressure, Heart Rate, Sweating, Tears in each parameter there is sub score of 0, 1, 2)0-4 score is good as patient has depth of anaesthesia, >4 grade suggest awareness. BIS was only available for 5 patients of group B & 5 patients of group A technique. It was managed between 60-70.⁽⁴⁾

Rescue fentanyl 50 mcg was given for further analgesia. After patients were fully awaked, when neuro surgeon performed speech testing and cortical mapping (language, motor tone of limbs, speech testing). Motor strength was tested by asking patients to move their fingers, dorsiflexion of toes against resistance. Patients advised to note change in sensation. Language was tested by asking patients to count or name list of objects & observe their speech arrestor hesitation.

Cortical Mapping⁽¹⁾

- It was done according to NRS scale. NRS scale of 0 is worst mapping, & 10 is excellent. NRS scale >7 was considered satisfactory.
- Patients were watched for adverse reactions like convulsion, respiratory depression, tight brain at the site of operation, hypercapnia, and bradycardia, Nausea, Vomiting.

After Mapping: (Asleep Period)

- Patients were asleep in both groups in following manner Without i-gel. (Dose of both study drugs increased to make patients asleep for closure of craniotomy)
- In group A Propofol Infusion was increased to 4 mg/ kg/ hour
- In group B Dexmedetomidine infusion was increase to 0.5 mcg/kg/hr
- After the resection of tumour remaining surgery was conducted with same rate. At the end.
- At timeline of skin closure, Dexmedetomidine/ Propofol infusion was stopped.

Postoperative Monitoring of Recovery

- It was accessed with Modified Aldrete score. (MAS)⁽⁵⁾
- When patients in both groups MAS of more then 7 they were shifted to postoperative recovery ward.
- Post operative course of patients was noticed in form of vitals, complications, mean hospital stay in days. Patient satisfaction score (Satisfactory, Good, Excellent), surgeon satisfaction score (Satisfactory, Good, Excellent) were noticed by Linkert scale.

Primary Outcome

It was ability to perform cortical Mapping.

Secondary Outcome

It was complications, patient satisfaction score, surgeon satisfaction score regarding Anaesthesia technique.

Statistical Analysis

- Observations were entered into Microsoft Excel, & analysed by SPSS SOFTWARE 16(IBM, Armonk, NY, USA)
- Data were expressed as mean, range, standard deviations. Categorical data were expressed as their measures (no., N, %).
- Unpaired t test used for Numerical values.
- Chi - square test, was used for assessment of categorical data.
- p>0.05 is non-significant (NS)
- p<0.05 is significant(S).
- p<0.001 is highly significant (HS)

RESULTS

Parameters	Group A (n=25)	Group B (n=25)	p-Value (Inference)
Age (Years)	44+/-12	42+/-14	>0.05 (NS)
Sex (M/F)	18:7 (72%:28%)	17:8 (68%:32%)	>0.05 (NS)
ASA Grade (I/II)	15:10 (60%:40)	14:11 (56%:44)	>0.05 (NS)
Duration of surgery (mins)	125+/-10	120+/-15	>0.05 (NS)

Table 1. Demographic Data

Table 1. Shows comparable Demographic data in each group

Time	HR mean+/-SD (Group A) (n=25)	HR mean+/-SD (Group B) (n=25)	P value (Inference) For HR	MAP mean+/-SD (Group A) (n=25)	MAP mean+/-SD (Group B) (n=25)	p value (Inference) For MAP
0 min	100+/-12	100+/-14	>0.05 (NS)	100+/-6	100+/-2	>0.05 (NS)
15 min.	90+/-14	88+/-12	>0.05 (NS)	98+/-4	96+/-4	>0.05 (NS)
30 min	88+/-12	86+/-14	>0.05 (NS)	96+/-2	94+/-2	>0.05 (NS)
45 min	78+/-12	76+/-14	>0.05 (NS)	96+/-4	96+/-2	>0.05 (NS)
60 min	77+/-13	78+/-12	>0.05 (NS)	92+/-6	92+/-4	>0.05 (NS)
75 min	88+/-14	86+/-12	>0.05 (NS)	90+/-2	90+/-2	>0.05 (NS)
90 min	84+/-16	84+/-14	>0.05 (NS)	90+/-4	90+/-2	>0.05 (NS)
120 min	86+/-16	84+/-16	>0.05 (NS)	90+/-2	88+/-4	>0.05 (NS)
150 min	82+/-14	80+/-14	>0.05 (NS)	92+/-4	92+/-2	>0.05 (NS)
180 min	80+/-12	80+/-14	>0.05 (NS)	100+/-4	100+/-2	>0.05 (NS)

Table 2. Haemodynamic Parameters

*Table 2. Perioperative haemodynamics were stable and comparable in both groups

Parameters	Group A (n=25)	Group B (n=25)	P value
SpO2	95+/-4	98+/-2	<0.05 (S)
ETCO2	38+/-8	32+/-6	<0.05 (S)
NRS scale	9.2+/-0.3	9.4+/-0.2	>0.05 (NS)

Table 3. Perioperative Respiratory & Cortical Mapping Monitoring (p<0.05)

* Patients EtCO₂ remain within limit ranging from 26 to 32 mm of Hg during entire operation in group B. In group An EtCO₂ was slight elevated. 4(16 %) patients of A group developed shortness of breath, anxiety, hypercapnia 46.7 mm of Hg(mean) and desaturation of 91%, they were managed by increase oxygenation, ask the patient to deep breath, , rescue fentanyl 50 mcg. and decreasing infusion rate of propofol

* There was not a single episode of hypercarbia and respiratory depression, or desaturation in any of patients during entire group B.

*NRS scale was more in dexmedetomidine group than propofol group, but it was statistically non-significant. (p>0.05)

Adverse Effects	Group A (n=25)	Group B (n=25)
Hypercarbia	4 (16%)	-
Seizures	7 (28%)	4 (16%)
Nausea	2 (8%)	2 (8%)
Bradycardia	2 (8%)	2 (8%)
Tight brain	10 (40%)	-
Awareness	Nil	Nil

Table 4. Adverse Effects

* Intraoperative seizures were present in 4(16%) patients in group B, 7 patients (28%) in group A, which was present during mapping due to touching of functional areas of cortex., stopped by cold saline irrigation
 * Nausea and Bradycardia was present Perioperatively in 2 (8%) patients in each group which was due to deep cortical resection near midline treated accordingly. by coordinating with surgeon to reduce traction, administration of anticholinergic more effective than antiemetic.
 * 10 patients in group A (40%) have tight brain which was relieved by increased propofol infusion rate, rescue fentanyl bolus 50 mcg and frusemide.
 *There was no awareness in each group, as in both groups depth of anaesthesia was adequate

Parameters	Group A (n=25)	Group B (n=25)	p-Value
Modified Aldrete Score	8+/-0.8	9+/-0.2	>0.05
Mean Hospital Stay(days)	3.98	3.50	<0.05
Patient Satisfaction Score	Satisfactory	Good	-
Surgeon Satisfaction Score	Good	Excellent	-
Rescue Fentanyl Requests (50 mcg/ number)	2+/-1	1+/-1	<0.05

Table 5. Postoperative Recovery Parameters

* No Patient in each group had awareness during Asleep period (By PRST score/ BIS). PRST score up to 4& BIS up to 60-70 were maintained in each group by rescue fentanyl requests 50 mcg per number. More Analgesic requests were in Propofol group. (P< 0.05)
 * Post operative recovery in form of Modified Aldrete score in group A (propofol) was 8+/- 0.8, & in group B (Dexmedetomidine) it was 9+/-0.2.(P>0.05)
 * In Postoperative period, vitals were with in normal limits in both groups & no complications noted (P>0.05)
 * Mean hospital stay was more 3.98 days in group A whereas 3.50 days in group B. (p<0.05)
 * Patients satisfaction score was good with group B(Dexmedetomidine) & satisfactory with group A(propofol)
 * Surgeon satisfaction score was excellent with dexmedetomidine (group B) & good with propofol (group A)

DISCUSSION

Management of anaesthesia for awake craniotomy varied as evolution in various anaesthetic drugs, technique, as well as gazettes available for Anaesthesia.

Awake craniotomy poses unique challenges especially for the anaesthetist who is faced with an unprotected airway and limited access to the patient due to positioning and pinning of the head.⁽⁶⁾

So, appropriate patient selection, counselling is important for this method.⁽⁷⁾

Patient require sedation or general anaesthesia until the brain is exposed and again at the end of surgery while the cranium is closed.

In present study, both groups patient’s premedication was done in same manner.

Goettal N Bhardwaj S⁽⁸⁾ have also compared Dexmedetomidine & Propofol for conscious sedation for awake craniotomies.

We have used IV Dexmedetomidine/ propofol as they provide sedation without cognitive impairments.⁽⁹⁾

Scalp block was given with 0.5% Ropivacaine (max. 30 ml) to decrease pain.⁽¹⁰⁾ & maintaining hemodynamic Stability.⁽¹¹⁾

Intraoperative sedation was assessed by Ramsey sedation score RSS was managed around 3 At time of mapping, and 2 after mapping. sedation should be titrated as under sedation cause anxiety, hypertension, tight Brain & over sedation causes desaturation, problem of correspondence during mapping.^(12,3)

In both groups airway was managed by second generation LMA (i-gel) as it can be removed with minimum access & with out causing Laryngeal irritability.^(13,14,11)

Scalp Block

It provides Perioperative & post operative analgesia. No patient had emergence hypertension. We have to modify our management in 4 patients in Group A (Propofol) as they have desaturation, but they were normal with in 2 min.^(7,15)

In both groups Haemodynamic stability was there in asleep, Awake &Asleep all 3 phases, it shows that dexmedetomidine & propofol provide minimum change in cardiac parameters in lower doses, as well as scalp block with Ropivacaine provide good quality of analgesia so that patient didn’t have tachycardia or hypertension although they were awake arousable, surgery was going on in awake phase & patients had stable haemodynamics.

NRS Scale

It was good (>8 in each group) & comparable in both groups.

Goettal N, Bhardwaj S have also used NRS scale to access cortical Mapping for awake craniotomies (Monitored Anaesthesia Care technique-MAC. They have comparable NRS Score in both groups.⁽⁸⁾

Esenonu et al had also used scalp block with AAA method & had stable haemodynamics.⁽¹⁶⁾

Goettal N, Bhardwaj S also record more complications in Propofol group.

Complications observed in our study were comparable with study of Esononu CL,⁽¹⁶⁾ in terms of complications, haemodynamics stability, hospital stay.

Postoperative vitals & postoperative recovery (Modified Aldrete score) was comparable & with in normal limits in both groups.

Mean hospital stay was less in group B, which was statistically significant ($P < 0.05$)

Scientists are inventing method for outdoor awake craniotomy.⁽¹⁵⁾

Esononu have similar mean hospital stay.

Patients satisfaction score & Surgeon satisfaction score Mean hospital stay, less complications incidences were more in favour of dexmedetomidine group.

Limitations

1. Limitations of our study were- we have done study in limited number of cases, large scale study required.
2. Study design for day care surgery or early ambulation surgery for uneventful tumour resection should be done.
3. BIS monitoring for depth of Anaesthesia is more useful than RSS, which was available for only 5 patients of each group.

CONCLUSION

AAA technique for awake craniotomies was successful with propofol or dexmedetomidine. Few adverse effects were noted with propofol group that can be corrected easily.

In a nutshell, AAA technique with dexmedetomidine is more effective than Propofol group for maintenance during awake craniotomies.

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