VOLUME - 12, ISSUE - 08, AUGUST - 2023 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Anaesthesiology

COMPARATIVE STUDY OF DEPTH OF ANAESTHESIA ASSESSMENT: PRST SCORE VERSUS BISPECTRAL INDEX IN PATIENTS UNDERGOING GENERAL ANAESTHESIA.

Dr Prabhu B G	(MBBS, MD Anaesthesia) , Professor, JJM Medical College Davangere.
Dr Sindhu G B	MBBS, JJM Medical College Davangere.
Dr Devaraj Koppad	MBBS, JJM Medical College Davangere.
Dr Mahima Bahuguni	MBBS, JJM Medical College Davangere.

ABSTRACT

Background And Objective: Having an adequate level of anaesthesia is crucial when doing surgery. Above-desired levels of anaesthesia may cause cardiovascular depression, where as light planes of anaesthesia may cause numerous feared consequences. Therefore, determining the level of anaesthesia is crucial to anaesthesia practice. The study's main goal is to evaluate the PRST scores between two groups of patients whose depth of anaesthesia is being monitored with and without BIS. Secondary goals include comparing the duration of recovery when evaluated with PRST score and BIS index and evaluating intraoperative consciousness using the Modified Brice Questionnaire. **Methods:** 100 patients aged between 18-65 years of age of either sex and belonging to ASA 1 and 2 posted for elective surgical procedures under general anaesthesia in Chigateri General Hospital and Bapuji Hospital attached to JJM Medical College, Davangere were divided into two groups 50 each. In the first group, the depth of anaesthesia was assessed using clinical parameters and in the second group, along with clinical parameters, BIS was also used for assessing the depth of anaesthesia. **Results:** The PRST score of group 2 was significantly lower when compared with group 1 during all the five points of monitoring. The anaesthesia time after the surgical procedure was 14.1 ±1.43 in Group 1 while it was 8.22 ± 1.95 in Group 2. This difference in anaesthesia time was found to be statistically significant with p value <0.0001. **Conclusion:** Use of BIS monitoring facilitates anaesthesiologists assess depth of anaesthesia and titrate use of anaesthetic agents.

KEYWORDS : Intraoperative awareness; BIS;PRST Score.

INTRODUCTION :

Depth of Anaesthesia or depth of hypnosis indicates progressive depression of central nervous system (CNS) and diminished responsiveness to stimulation by a general anaesthetic agent, depending on the potency of the anaesthetic agent and the concentration in which it is administered. A successful GA is defined as a reversible triad which includes hypnosis, analgesia, and abolition of reflex activity.[1] An inadequate GA can lead to intraoperative awareness with or without recall, where as overdosage results in delayed recovery and possible postoperative complications.

The depth of anaesthesia was actually equated with the depth of CNS depression when the anaesthetic state was produced by one drug with relatively low specificity of action.[2] Therefore, a single index reflecting CNS depression in general could be used as a measure of anaesthesia.

Intraoperative awareness during general anaesthesia is a very rare incidence of 1 to a few in 1000 GA cases.[3,4] Awareness during anaesthesia can be explicit or implicit memory. The reported incidence of intraoperative consciousness or explicit memory recall, varies from 0.2% to 2%.[5]

In most of the cases of awareness is due to human error or faulty anaesthetic technique or apparatus failure, such as failure to turn on the anaesthetic or monitor the patient. Around 2.5% of claims of awareness are spurious. [6]

Attainment of adequate depth of anaesthesia during surgery is very important to prevent intraoperative awareness. Depth of anaesthesia more than therequired level may result in cardiovascular depression where else light plane of anaesthesia will be harmful to patient. Here comes the importance of assessment of depth of anaesthesia. [7]

There are a variety of different indicators to measure depth of anaesthesia. Many studies have demonstrated that they are not completely reliable. Accurate monitoring of the level of consciousness and the potential awareness of an anaesthetized patient require different techniques. The present study is designed to Compare the depth of Anaesthesia using PRST score or Evan's score and Bispectral Index in patients undergoing General Anaesthesia.

Objectives Of Study :

Objectives of the study include 1) comparision of the PRST score in 2 group of patients in whom depth of anaesthesia is monitored with BIS and without BIS.

2) Comparision of the duration of recovery when monitored PRST score and BIS Index. 3)To assess immediate preoperative, intraoperative and post operative awareness with Modified Brice Questionnaire. 4)To evaluate the incidence of awareness during general anaesthesia and any adverse effects perceived.

METHODOLOGY:

The present study is a Prospective observational study, where 100 patients of ASA PS grade 1 and 2 undergoing surgeries under general anaesthesia were selected in Chigateri General Hospital and Bapuji Hospital attached to JJM Medical College, Davangere.

Inclusion Criteria: Subjects of both sexes aged 18-65 years, ASA 1 and ASA 2, Willing to participate in the study, Surgeries under general anaesthesia.

Exclusion Criteria: Patients with Dementia, Patient not willing to give consent, Emergency surgery, H/O Substance abuse.

After approval by the institutional ethics committee, informed written consent was taken from patients after explaining the procedure in their own language. 100 patients of ASA PS grade 1 and 2 of both sexes aged 18-65 years, undergoing surgeries under general anaesthesia were randomly divided into 2 groups.

Group 1- depth of anesthesia will be assessed by Evan's score

or PRST score. Group 2- by BIS index monitoring and PRST score

All the respondents were interviewed 24hours after the surgery according to a prepared questionnaire (Modified Brice questionnaire) about immediate preoperative, intraoperative and postoperative awareness.

Before induction, all patients were premedicated using midazolam (0.05 mg / kg).For induction of Anesthesia Inj.Propofol will be used with a dose of 1.5 to 2.5 mg/kg, for muscle relaxation appropriate dose of atracurim /vecuronium/rocuronium will be used while the anesthesia is maintained with oxygen, nitrous oxide and Isoflurane, and analgesia with opioids.

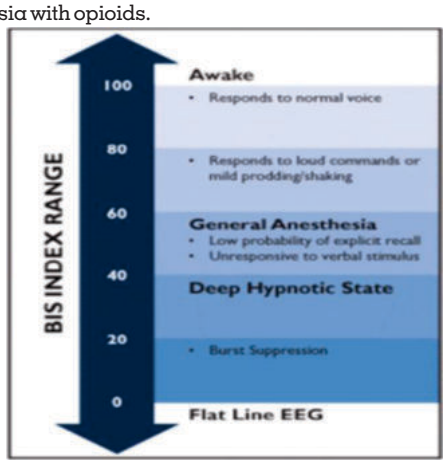


Figure 1: BIS index Range

Group 1

In the first group of respondents, before the introduction of anaesthesia blood pressure and heart rate values are noted (t0). At the time of intubation (t1), the first skin incision (t2), 30 min after the first incision (t3), 30 minutes after t3 reading (t4)and immediately after placing the last suture of the skin (t5) the same parameters are noted ad changes recorded.

The occurrence of tears in the closed eye or while opening the eye, sweating are noted at the same time intervals. Each parameter was scored from 0 to 2 and by summing up all the points obtained by the PRST score; the depth of anaesthesia was estimated.

Group 2

In the second group of subjects, to estimate the depth of anesthesia, a BIS index monitor is used. Before the introduction of anesthesia unilateral BIS sensor, that records the EEG waves, is mounted on cleaned and dried fore-head. BIS sensor with the appropriate cable is connected with the BIS monitor that displays the EEG waves and BIS index value.

Using a sensor that is placed on the patient"s forehead BIS monitoring translates information from the electroencephalogram into a simple number that is read on a monitor and represents the patient"s state of mind.

The BIS index values are maintained in the range 40- 60, which is considered adequate depth. While noting BIS index quotation, the PRST score is determined and noted, too. BIS index is monitored continuously, values recorded at the same intervals as in Group-1. After the completion of surgical procedure, post operatively, Modified Brice Questionnaire was asked.

Parameters monitored included - (a) PRST score, (b) BIS, (c) time of anaesthesia, (d) intraoperative awareness assessment using post op questionnaire with Modified Brice Questionnaire.

Questionnaire

- Age Gender
- Date of admission Date of surgery Name of surgery
- Whether having any comorbid illness Yes No If yes, mention it
- Any addictions : Alcoholism Smoking Substance abuse Others

Modified Brice Questionnaire

1)What is the last thing you remember just before going to sleep

- (a)Being in pre-operative area (c) feeling mask on the face (b)being with family (d)stinging IV line (e)seeing operation theatre (f) hearing voices (g) smell of gas (h) others

2) What is the first thing you remember after waking up?

- (a) hearing voices (b) feeling breathing tube (c) being in recovery room (d) feeling mask on face (e) being in ICU (f)being with family (h) others

3) Do you remember anything in between going to sleep and waking up?
NO

- If yes, (a) hearing voices (b) unable to move or breathe (c) feeling pain (d) feeling surgery without (e) hearing events of surgery (f) anxiety/stress (g)sensation of breathing tube (h) others

4) Did you dream during procedure? No If yes- about what?

5)Were your dreams disturbing you? (1) Yes (2) No

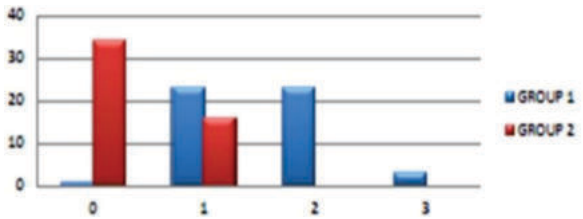
RESULTS:

The participants were divided into groups. Group 1 had 50 participants and Group 2 also had 50 participants. The ratio of participants in Group 1 : Group 2 was 1:1. Maximum number of study participants were in the age group of 50 – 59 years in Group 1 accounting for 28% followed by 26% in 20 – 29 years age group.

Maximum number of study participants were in the age group of 30 – 39 years and 50 – 59 years age group accounting for 28% each.

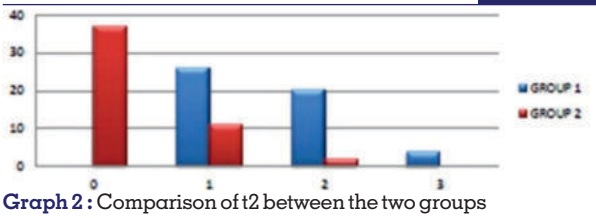
The mean age of the participants in Group 1 was 39.78 and that of Group 2 was 40.06. Statistically there was no significant difference in the mean ages between the two groups. Therefore age of the study participants will not be a cause of bias in the study.

During the skin incision (T2 period), PRST score was 3 in 4(8%) of the patients in Group 1. There was no participant with score of 3 in Group 2. The mean PRST score in Group 1 was 1.56±0.64 and 0.3 ± 0.54 in Group 2. The difference in mean PRST score was found to be statistically significant.



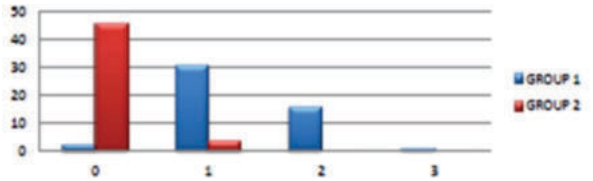
Graph 1 : Comparison of t1 between the two groups

In Group 1, 3(6%) patients had a PRST score of 3. None of them in Group 2 had a PRST score more than 1. The mean PRST score in Group 1 was 1.56±0.64 whereas it was 0.32± 0.47 in Group 2. Mann Whitney U test was done to see if there was a statistically significant difference between the two groups. There was a statistically significant difference between the two groups with p value <0.0001.



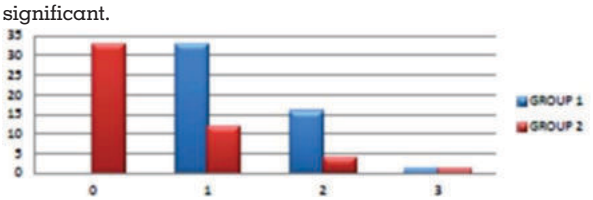
Graph 2 : Comparison of t2 between the two groups

During the skin incision (T2 period), PRST score was 3 in 4(8%) of the patients in Group 1. There was no participant with score of 3 in Group 2. The mean PRST score in Group 1 was 1.56±0.64 and 0.3 ± 0.54 in Group 2. The difference in mean PRST score was found to be statistically significant.



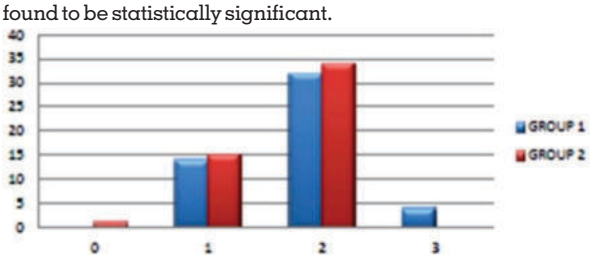
Graph 3: Comparison of t3 between the two groups

During T3 (30 minutes after first skin incision), PRST score was 3 in 1(2%) of the patients in Group 1 and no participants had a score more than 1 in Group 2. The mean PRST score in Group 1 was 1.32 ± 0.58 and it was 0.08 ± 0.27 in Group 2. This difference in PRST score was found to be statistically significant.



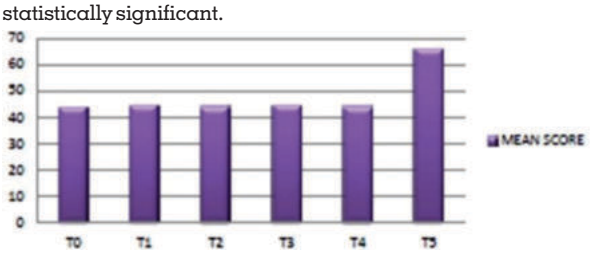
Graph 4: Comparison of t4 between the two groups

During T4 (30 minutes after T3 reading), only 1(2%) of the participant had a PRST score of 3 in both Group 1 and Group 2. The mean PRST score in Group 1 was 1.36 ± 0.52 and it was 0.46 ± 0.73 in Group 2. This difference in PRST score was found to be statistically significant.



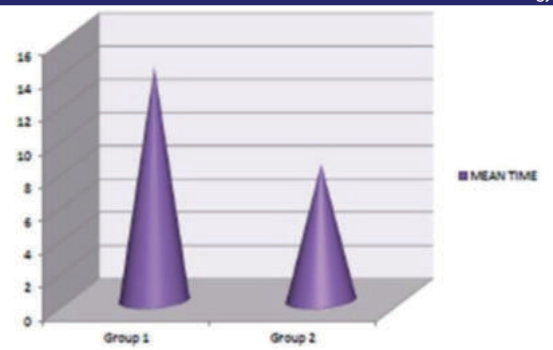
Graph 5: Comparison of t5 between the two groups

During T5, 4(8%) of the patients had PRST score of 3 in Group 1 while none of them had a score more than 2 in Group 2. The mean PRST score in Group 1 was 1.8 ± 0.57 while it was 1.66 ± 0.51 in Group 2. This difference was not found to be statistically significant.



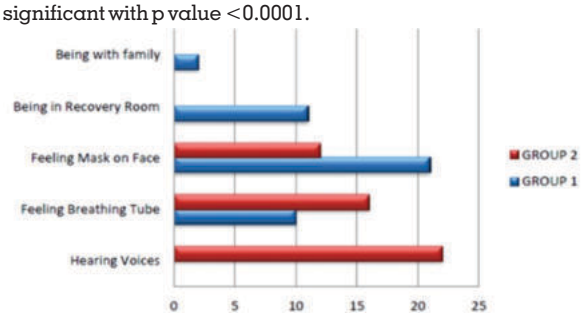
Graph 6 : BIS score in the study population belonging to group 2

There was a transient increase in BIS score following tracheal intubation. Post induction BIS value was 44.02 ± 5.80. During recovery phase, BIS values were maintained at 65.8 ± 9.16.



Graph 7 : Anaesthesia time after surgical procedure in both the groups

The anaesthesia time after the surgical procedure was 14.1 ±1.43 in Group 1 while it was 8.22 ± 1.95 in Group 2. This difference in anaesthesia time was found to be statistically significant with p value <0.0001.



Graph 8 : First thing patient remembers after waking up

In Group 1, most of the patient remembers feeling mask on face accounting for 42%. In Group 2, most of the patients remember hearing voices accounting for 44%. 26% of Group 1 had a delayed recovery from anaesthesia while compared with second group. Assessment was done with modified Brice questionnaire.

DISCUSSION :

Assessment of depth of anaesthesia is based on clinical signs which represent a response of Autonomic Nervous System. Use of pharmacological agents like opiods, cholinergic drugs, Beta blockers, vasodilators and antihypertensives mask the autonomic response and hinders the assesment of depth of anaesthesia.

In our study, the depth of anaesthesia in first group of subjects was assessed only on the basis of PRST score. In the second group we used BIS monitoring along with PRST score.

Patients were induced with midazolam, propofol and vecuronium. After induction, the BIS at T0 was 43.4 ± 4.62. There was a transient increase in BIS value following tracheal intubation (T1).

The mean of PRST score of group 1 at T1 was 1.56± 0.64, while that of group 2 at T1 was 0.32± 0.47. According to mean value at T1, we had an adequate depth of anaesthesia. But analysis of individual values showed a value of 3 in 3 patients, indicating a shallower anaesthesia. So in five period assessment for depth of anaesthesia by PRST score, even in some, had not achieved an adequate depth of anaesthesia. But while conducting the post operative interview after 24 hours, all of them gave a negative answer for recall of events during surgery.

In our study, PRST score of group 2 was significantly lower than the PRST scores of group 1 in all time variants. During the whole process of study, only a single patient in group 2 had PRST value of 3, but never had 4.

Use of BIS monitoring during surgical procedures, aside from preventing the occurrence of intraoperative awareness, it allows more precise dosing of anaesthetics, shorter staying in recovery room and reduces incidence of postoperative nausea and vomiting.

Davidson AJ et al in their study showed that immediate post extubation, the BIS values were 87.48 ± 5.27 and it increased to 93.4 ± 2.82 within 15 minute .[8]

In the study conducted by **Gan TJ** et al, the patients who were oberved with BIS showed faster recovery than the control group[9].

Similar to our study In 2015 **Rahul R et al** [10] conducted a prospective clinical study on 160 patients undergoing surgery. Results showed that BIS monitoring is better for precise decision making and balancing the dose of anaesthetics.

In 2014 **Punjasawadwong Y et al** [11] concluded that BIS – guided anaesthesia can reduce the risk of intraoperative awareness among surgical patients athigh risk of awareness in comparison to using clinical signs as a guide of anaesthetic depth which is in accordance to our study.

Limitations : Sample size was only 100 in this study. More accurate results would have been possible if a larger sample size was used.

CONCLUSION :

The anesthesiologists can better monitor the depth of anaesthesia thanks to bispectral monitoring. It will aid in avoiding unintended sedation and other hypnotic drug adverse effects.

BIS monitoring is a non-invasive technique for measuring depth of anaesthesia . BIS monitoring is not a substitute for a clinical evaluation of anaesthesia depth. Therefore, along with clinical parameters BIS aids in decision-making and facilitates the titration of anaesthetics, other medications, such as analgesics, and cardioactive drugs and achieve the best possible outcome for the patients especially in those who are with higher operative risk.

REFERENCES :

1. Bhargava AK, Setlur R, Sreevastava D. Correlation of bispectral index and Guedel's stages of ether anesthesia. AnesthAnalg 2004;98:132-4.
2. Kissin I. Depth of anesthesia and bispectral indexmonitoring.AnesthAnalg 2000;90:1114-7.
3. Sandin RH, Enlund G, Samuelsson P, Lennmarken C. Awareness during anaesthesia: a prospective case study. The Lancet, 2000;355(9205):707-711.
4. Sebel PS, Bowdle A, Ghoneim MM, Rampil IJ, Padilla RE. The incidence of awareness during anesthesia: a multicenter US study. Anesthesiology. 2003;99(Suppl):A-360.
5. Liu WH, Thorp TA, Graham SG, Aitkenhead AR. Incidence of awareness with recall during general anaesthesia. Anaesthesia 1991;46:435-7.
6. Brown EN, Lydic R, Schiff ND. General anesthesia, sleep, and coma. N Engl J Med. 2010;363(27):2638-2650.
7. Sandin RH, Enlund G, Samuelsson P, Lennmarken C. Awareness during anaesthesia: a prospective case study. The Lancet, 2000;355(9205):707-711.
8. Davidson AJ, Czarnecki C. The Bispectral Index in children: comparing isoflurane and halothane. Br J Anaesth. 2004;92(1):14-17.
9. Gan TJ, Glass PS, Windsor A, Payne F, Rosow C, Sebel P, et al. Bispectral index monitoring allows faster emergence and improved recovery from propofol, alfentanil, and nitrous oxide anesthesia. Anesthesiol J Am Soc Anesthesiol. 1997;87(4):808-815.
10. Rahul R, Sowmya MJ, Rangalakshmi S, Roshan Kumar BN, Karthik GS. Monitoring depth of anaesthesia using PRST score and bispectral index. Journal of Evolution of Medical and Dental Sciences. 2015 Mar 26;4(25):4282-92.
11. Punjasawadwong Y, Phongchiewboon A, Bunchungmongkol N. Bispectral index for improving anaesthetic delivery and postoperative recovery. Cochrane Database Syst Rev. 2002;6.