

## Original Paper

**Comparison of Anesthesia Depth Monitoring using Conventional and Bispectral Index on Incidence and Severity of Nausea and Vomiting after Urological Surgeries**Reihan Shenasi<sup>1</sup>, Hamzeh Hoseinzadeh<sup>2</sup>, Hassan Mohammadipour Anvari<sup>3</sup>, Davod Aghamohammadi<sup>4</sup>, Reza Sari-Motlagh<sup>5\*</sup><sup>1</sup>Anesthesiologist, Tabriz University of Medical Sciences, Imam Reza Hospital – Golgasht Street – Tabriz – Iran<sup>2</sup>Professor of Anaesthesiology, Tabriz University of Medical Sciences, Imam Reza Hospital – Golgasht Street – Tabriz – Iran<sup>3</sup>Assistant professor of Anesthesiology, Tabriz University of Medical Sciences, Imam Reza Hospital – Golgasht Street – Tabriz – Iran<sup>4</sup>Assistant professor of Anesthesiology, Tabriz University of Medical Sciences, Imam Reza Hospital – Golgasht Street – Tabriz – Iran<sup>5</sup>Urologist, Tabriz University of Medical Sciences, Imam Reza Hospital- Golgasht Street- Tabriz - Iran**Corresponding Author:** Reza Sari-Motlagh, E-mail: motlagh.reza.dr@gmail.com**ARTICLE INFO***Article history*

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**Key words:**Bispectral Index Monitor,  
Nausea,  
Vomiting**ABSTRACT**

Bispectral index parameter is used to guide the titration of general anesthesia. This monitoring improves recovery times and hospital discharges, as well as minimizes adverse events. The objective of this study is the comparison of anesthesia depth monitoring by conventional and bispectral index on nausea and vomiting after urological surgery. 180 participants who were scheduled for abdominal urological surgery were studied. Patients before induction of anesthesia were randomized into two groups with and without bispectral index monitoring. Incidence and severity of nausea and vomiting were recorded every 30 minutes for 2 hours and every 6 hours to 24 hours after surgery. The incidence of postoperative nausea and vomiting in Bispectral index group is 14.4% and 8.9% and in control group 28.9% and 23.3%, respectively. The risk of nausea and vomiting after surgery was reduced by 14.5% and 14.4%, respectively in patients monitored with bispectral index.

**INTRODUCTION**

Nausea is the conscious perception of medulla stimulation that is associated with vomiting center and create vomiting response (1). General anesthesia with the use of inhalants can cause nausea and vomiting after surgery (Postoperative nausea and vomiting, PONV). The incidence of PONV is reported about 20-30 percent (2). It seems that multiple-factor can cause PONV and few items such as anesthetic drugs, kind of surgery and personal risk factors is effective on PONV. These factors make into two categories that includes factors out of control by anesthesiologists and factors can control by anesthesiologists.

1. Factors out of control by anesthesiologists: some of these factors are age, gender, past history of PONV and motion sickness, smoking, kind of surgery, operating time and anesthesia time, anxiety of patients and parents.
2. Factors controlled by anesthesiologists: these factors are associated of anesthesia settings, including premedications, kind of anesthesia, anesthesia drugs during sur-

gery, management of anesthesia after surgery and anti-emetic drugs.

Efforts were carried out in the last two decades for the quantitative measurement of anesthesia depth during the surgery led to the invention of methods such as (Somatosensory Evoked Potentials) SSEP, (Brain stem Auditory Evoked Potentials) BAEP and (Visual Evoked Potentials) VEP. During recent years, a new method called BIS (Bispectral index) was introduced by Chamoun and Sigl (3), and BIS was enjoyed of public acceptability due to the accuracy and facility (4). There are several studies on the impact of Bispectral index monitoring on postoperative nausea and vomiting, the results of these studies was in paradox (5-11), some studies were confirmed the significant reduction of PONV and some studies was not confirmed this reduction.

However, according to two randomized clinical trials, there is a 12% reduction of postoperative nausea and vomiting by Bispectral index monitoring comparison of conventional monitoring (12). In overall, this monitoring improves

recovery times and hospital discharges, as well as minimizes adverse events.

The main objective of this study is a comparison of anesthesia depth monitoring impact of the conventional and Bispectral index on nausea and vomiting after urological surgery.

## MATERIAL & METHODS

We designed a double blind randomized controlled clinical trial. The inclusion criteria were all Urological surgery candidates under general anesthesia, The American Society of Anesthesiologists Physical Status classification I-II and age limit was 20 to 60 years old. Exclusion criteria included any Co-morbidity (Liver, kidney, cardiovascular, central nervous system, gastrointestinal, respiratory, infectious, metabolic, glaucoma), blood transfusion during surgery, long time operating surgery (more than two hours), drug hypersensitivity, emetic and antiemetic drugs use before surgery, pregnant or lactating women, peritoneal manipulation, oxygen therapy after surgery, body mass index more than 30 and motion sickness disease. Before recruitment start date, the proposal was approved by the Ethical Committee of Tabriz University of Medical Sciences afterward the clinical trial was submitted at the Iranian Registry of Clinical trial (IRCT) by ID number: IRCT2016042312668N2, IRCT is under supervision of the World Health Organization (WHO).

After informed consent reception of all patients, 180 urological surgery candidates enrolled and according to random block are placed in two parallel groups, the first Bispectral index and the second conventional monitoring.

After proper hydration, premedication is done in all patient same that was Midazolam 0.3 mg/kg and Remifentanil 2 micg/kg five minutes before induction of anesthesia.

Induction of anesthesia drugs was same in all patients, including Propofol 2 mg/kg with Cisatracurium 0.2 mg/kg. Tracheal intubation was done after disappearing muscle response and manual Ambu bag ventilation is done to disappear TOF responses. Anesthesia maintenance was same in all patients, including to Propofol and Remifentanil infusion 3mg/kg/h and 4micg/kg/h respectively along with 50% oxygen mixed with air.

Standard monitoring was same in all patients, including ECG (Electrocardiography), NIBP (Non-invasive blood pressure), BT (Body temperature), ETCO<sub>2</sub> (End tidal CO<sub>2</sub>), SaO<sub>2</sub> (Saturation of oxygen) and TOF (Train of Four). Ven-

tilation did with 6-8cc/kg tidal volume and 12 per minute respiratory rate that ETCO<sub>2</sub> maintained 30 to 35. In the first group, drugs infusion was set for bispectral index 40 -60 and in the second group, drugs infusion was set to maintain heart rate and blood pressure in the range of baseline  $\pm$ 20% if blood pressure decreased over than 20% of baseline with holding anesthesia depth, Ephedrine was used.

An additional dose of Cisatracurium according to TOF was used and at the end of the surgery drugs infusion stopped. After recovery of relaxation by TOF and reverse of breathing, endotracheal tube existed and relaxation was reversed. Relaxation recovery was obtained with TOF ratio more than 0.9. Incidence and severity of nausea and vomiting was recorded every 30 minutes for 2 hours and every 6 hours for 24 hours after surgery. Severity of nausea and vomiting is recorded by visual graded scale and patients who had nausea and vomiting graded from 1 to 10. 1 is minimum and 10 is maximum of severity. If during 24 hours after surgery for patients prescribe antiemetic drugs, kind, number and dose of antiemetic was recorded for each patient. Primary outcome is the incidence and severity of nausea and vomiting and secondary outcome is decreased use of antiemetic drug after surgery. Patients and after surgery data collectors were unaware about the kind of monitoring during surgery. Statistical analysis was done by SPSS v. 18 software and we appropriate lower than 0.05 of P value for statistically significant results.

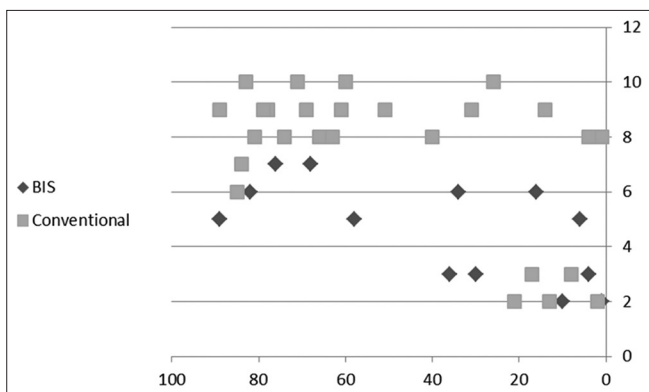
## RESULTS

180 patients appropriate with inclusion and exclusion criteria were enrolled in this study, all patients followed after surgery and all data analysed. Mean age of the control group is 43.28 years and BIS group is 42.63 years. There is 41 female and 49 male patients in the control group and 38 female and 52 male patients in BIS group, there are more details in Table-1.

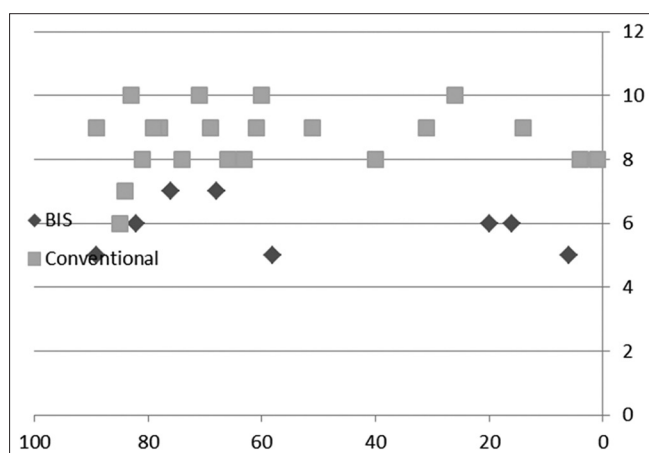
There were 26 nausea and 21 vomiting events in the control group and there were 13 nausea and 8 vomiting events in BIS group, Table-1. Severity of nausea and vomiting detected by patients by visual graded scale. 50<sup>th</sup> percentile scores of nausea severity were 9 in the control group and 6 in BIS group, 50<sup>th</sup> percentile scores of vomiting were 8 in the control group and 5 in the BIS group, Table-1. Distribution of severity scores for nausea and vomiting illustrate at (Figures 1 and 2). Number of antiemetic drugs that used for patients after surgery were 20 and 8 single doses in the control group and BIS group respectively, Table-1.

**Table 1.** The main results of the study

Variable	P value	Bispectral index monitoring	Conventional monitoring	Variable unite
Age	0.69	42.63 $\pm$ 11.36	43.28 $\pm$ 11.5	Year
Gender		42%F/58%M	46%F/54%M	Female/Male
Nausea	0.029	13 (14.4%)	26 (28.9%)	Event
Vomiting	0.014	8 (8.9%)	21 (23.3%)	Event
Nausea severity	0.006	6	9	Visual graded scale/50 <sup>th</sup> percentile
Vomiting severity	0.003	5	8	Visual graded scale/50 <sup>th</sup> percentile
Antiemetic drug use	0.018	8 (8.9%)	20 (22.2%)	Single dose



**Figure 1.** Distribution of nausea severity scores in Bispectral index and conventional group



**Figure 2.** Distribution of vomiting severity scores in Bispectral index and conventional group

**DISCUSSION**

Bispectral index monitoring is a reliable clinical method for assessment of brain function and on the other hand, anesthesia process can do unexplained responses during surgical procedures and also patient to patient. A proper dose of anesthesia drugs that can use during surgery is a challenge still. In this study 20 – 60-year-old patients were enrolled. Mean age of conventional group is 43.28 years and BIS group is 42.63 years. After comparing the mean age of the two groups, there is not significant statistical difference between two groups of study (P value 0.069) that demonstrate a proper distribution and randomization of this study Table-1. There are 38 female and 52 male patients in control or conventional group and 41 female and 49 male patients in the BIS group, few differences that exist in the number of female and male in two groups is due to nature of urological surgeries, urological surgeries are more common in men. According to studies that investigated postoperative nausea and vomiting by Bispectral index monitoring method, there was a 12% reduction of nausea and vomiting (12). This study illustrates 14.5% and 14.4% reduction of nausea and vomiting respectively Table-1, this reduction is statistically significant in both nausea and vomiting (P value is 0.029 and 0.014 respectively). According to Table-1, the events of nausea are more than vomiting in two control and BIS groups. In this

study, unlike the previous studies (6 and 12) nausea and vomiting events recorded separately, because all of nausea events are not with vomiting, nausea events is more than vomiting events. The sample size of this study is 180 urological surgery candidates that are more than previous studies (10 and 12), therefore results are more reliable for PONV. In most previous studies PONV was detected only in the second phase of recovery and ambulatory surgeries (12). We used a visual graded scale for detecting of nausea and vomiting severity and distribution of scores in BIS and control group shown in (Figures 1 and 2) that illustrate low severity scores in the BIS group compared to the control groups.

The 50<sup>th</sup> percentile of nausea and vomiting severity scores in BIS group is lower than the control group and this difference is statistically significant (P value is 0.006 and 0.003 for nausea and vomiting respectively). Nausea and vomiting events and severity was lower after surgery in the BIS group compared to the control group as well as taking antiemetic drug was lower in the BIS group compared to control group and this difference is statistically significant, (P value 0.018). According to the results of this study the reduction of taking antiemetic drug is proportional to reduction of vomiting. In all vomiting events, antiemetic drug is used and severity of vomiting cannot reduce more taking antiemetic drug.

Reduction of taking antiemetic drug after surgery has benefits such as economical frugality, reduction of antiemetic drugs side effect etc.

**CONCLUSION**

According to this study results, if Bispectral index score use for anesthesia depth monitoring during surgery, we will have a 14% reduction of vomiting and nausea events and significant reduction of nausea and vomiting severity.

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