



Original Article

Balanced Anesthesia VS General Anesthesia for Upper Abdominal Surgery-A Comparative Study of Outcome

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Abstract

This is a prospective randomized clinical study was done in the dept. of Rajshahi Medical College Hospital & in different Clinics in Rajshahi city from August 2013 to December 2014 to evaluate the outcome of patient undergoing upper abdominal surgery such as cholecystectomy, cholidocholithotomy, Nephrolithotomy, Gastrojejunostomy, Splenectomy, Hysterectomy, LUCS, Appendisectomy etc. by balanced anesthesia. This is also a comparative study of patient undergoing upper abdominal surgery either by balanced anesthesia or by general anesthesia. For this study 80 patients of upper abdominal surgery were randomly selected in two groups (Each group contain 40 patients) Group 'A' Patient received balanced anesthesia & group 'B' Patient received general anesthesia. Then these patient were monitored during per-operative & post operative period to evaluate its outcome. After completion of operation we have seen that those patent received balanced anesthesia had better outcome than general anesthesia undergoing upper abdominal surgery.

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Introduction

The concept of balanced anesthesia dates back to 1910, when George W. Crile introduced his theory of anociassociation. Crile taught that psychic stimuli with operations be prevented by light general anesthesia, whereas painful stimuli could be blocked by local analgesia/ regional anesthesia (Spinal anaesthesia). The term balanced anesthesia was introduced by Lundyin and suggested that a balance of agents and techniques (e.g., premedication, regional anesthesia and general anesthesia with one or more intravenous anesthetic agents) be used to produce the different components of General anesthesia (i.e., analgesia, amnesia, muscle relaxation and abolition of

autonomic reflexes with maintenance of homeostasis)¹⁻³. The aim of such anesthesia is to reduce the unwanted side effects of individual anesthesia and to ensure the desired effects of general anesthesia up to the level.

General anaesthesia (G/A) renders unconsciousness and unable to feel or, respond to the operation. To fulfill components of general anesthesia - we use anesthesia machine with gases such as oxygen, nitrous oxide, halothane & some drugs such as muscle relaxants (Vecuronium or Atracurionium), TPS (Thiopental sodium) or Propofol. Here TPS/Propofol/Halothane used to produce amnesia. Nitrous oxide used to produce

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analgesia, muscle relaxants used to produce muscle relaxation and loss of reflex.⁴⁻⁵

Previously general anesthesia was the only anesthetic procedure for upper abdominal surgery. Now a days we practice balance anesthesia as an alternative of general anesthesia because it is cost effective, easy procedure and helpful for our developing country and also applicable in peripheral clinics where Anaesthesia machine with gasses such as nitrous oxide, oxygen, halothane is not available. It is also helpful for geriatric group patients with variable diseases such as Myocardial infarction, Bronchial asthma, Pneumothorax, Hypertension, Liver diseases and Kidney diseases also. Because in G/A we use those drugs such as muscle relaxants not adequately excreted if pt. is suffered with associated renal and liver diseases and nitrous oxide which is harmful for lung disease patients, TPS is harmful in heart disease pt.. Also in balance anesthesia recovery is good and here normal respiratory pattern persists.⁶⁻⁷ We can choose balance anesthesia for all abdominal surgery. But usually lower abdominal surgery below umbilicus we can use spinal anesthesia (SAB) alone but in case of upper abdominal surgery SAB alone is not sufficient for anesthesia because parasympathetics supply especially vagus supply which is not block. But if we give some I/V anesthetic drugs in association with SAB such as low dose opioids (pethidine/ pentazocin/ Nalbupin/ Fentanyl) group of drugs or low dose ketamine with atropine we can do upper abdominal surgery by blocking parasympathetic effects. If we use these drugs as premedication before painful stimulus has effects that long outlast the presence of the analgesic in the body created the basis for the preemptive treatment of pain. This is to prevent the spinal cord from reaching a hyper-excitability state in which it responds excessively to afferent inputs. Thus preemptive analgesia can effectively attenuate peripheral and central sensitization of pain.⁸⁻¹⁰

Ketamine is a potent NMDA receptors blocker available for clinical use. The NMDA receptors are regarded as receptors of pain memory that maintain neuroplasticity and hyperplasia after the

initial painful stimulus (Surgical) has ended. Opioids group of drugs block on opioids receptors centrally. So no significant passage of pain impulse along the pain pathway. Opioid administration in balanced anaesthesia reduces anxiety and pain before the operation, decreases somatic and autonomic responses of airway stimulations, corrects hemodynamic stability and lowers the need for vaporizing anaesthetic drugs as well as a post-operative analgesia. Thus balance anesthesia performs long term analgesic effect post-operatively. With above all consideration, we can use balance anesthesia as an alternative of G/A in upper abdominal surgery in our developing country.¹¹⁻¹³

Objective of the study:

General Objective

To establish balanced anesthesia in exchange of general anesthesia for upper abdominal surgery in our developing country.

Specific Objective

- To see the outcome of balanced anaesthesia and general anaesthesia study.
- To find out whether balanced anaesthesia reduce unwanted side effects of general anaesthesia at any places.
- To find out feasibility of balanced anaesthesia in patients with medical disorders like MI, Bronchial asthma, Liver & Kidney disease etc instead of general anaesthesia.
- To assess effectiveness of balance anesthesia reducing postoperative pain control in comparison to general anaesthesia.
- To assess financial burden by cost of the therapy.

Rationale of the Study:

Previously general anaesthesia was the only anesthetic procedure for upper abdominal surgery. Now a days we practice balanced anaesthesia as an alternative of general anaesthesia to help poor people of our country in rural area for all kinds of abdominal surgery especially upper abdominal surgery which is not possible with spinal anesthesia (SAB) alone or with I/V anesthetic

drugs alone. It is also applicable in peripheral clinics where G/A machine with gasses such as nitrous oxide, oxygen, halothane is not available. Thus with low cost, easy procedure and safety measure we can use balanced anesthesia for upper abdominal surgery in rural area for general people in our country.

Many studies about balanced anaesthesia have been performed in developed countries.

There is hardly any documented study from our country. Therefore this study will be beneficial for our developing country.

Hypothesis

- Balanced Anaesthesia can be done as an alternative of general anaesthesia in any places which is safe and cost-effective.
- Balanced Anaesthesia provides more pain controlling capacity and good recovery than general anaesthesia in the post operative period.

Variable of the study:

A). Independent variables

- Age & Sex of the patient
- Body mass index
- ASA grading
- Operation time

B). Dependent Variables (Patients outcome)

- Pulse / Heart rate
- Blood pressure
- Vomiting
- Sweating
- Pain
- Respiratory condition (SPO2)
- Consciousness / Recovery

Methodology:

- Materials and method
- Study design: This is a prospective study would be conducted in dept. of anesthesia, Rajshahi Medical College Hospital and some clinics in Rajshahi city. The study design would be randomized control trial.
- Study setting: This study will be carried out in the dept. of anesthesia, Rajshahi Medical

College Hospital and also in different clinics in Rajshahi City.

- Study period: This study will be carried out from August, 2013 to June, 2015.
- Study Subject : Balance Anesthesia VS General Anesthesia for upper abdominal surgery a comparative study of outcome
- Inclusion criteria: Average Patients undergoing abdominal surgery usually ASA grading I II & III and average body mass index.
- Exclusion criteria: Patients in stage of shock or bleeding disorder and ASA grading IV & V and patient with neurological deficit.
- Sampling technique : Simple random Sampling
- Sample size : 80
- Study protocol: After obtaining written informed consent, a total 80 patients of ASA grading I & II selected for abdominal surgery randomly. Among them mostly upper abdominal surgery such as Cholecystectomy, Appendectomy, Gastrojejunostomy, Nephrolithotomy, Nephrectomy, Hysterectomy, LUCS, etc. These patients are divided two groups either by balanced anesthesia or by general anesthesia. The patients were visited on the day before surgery for pre anesthetic check up. Which include patient's clinical examination and routine investigations (such as Hb%. TC DC, Blood sugar, Serum creatinine, CXR, ECG etc.) and special investigations such as ECO, electrolytes etc. Also to give concept of visual analogue scale (VAS) for pain scoring.

Procedure

Patients randomized to balance anesthesia:

After giving intravenous (I/V) channel with associated Connections at first we position the patient for spinal anesthesia either sitting or right lateral decubitus position and a 25- gauge pencil point spinal needle was introduced into the subarachnoid space at the L2- L3 intervertebral space under aseptic conditions. After free flow of CSF was obtained, 3 to 4 ml of hyperbaric

bupivacaine hydrochloride with 20 μ g of Fentanyl citrate was injected intrathecally. Then the Patients was placed in the supine position, staying in the Trendelenburg position (head down) for 3 minutes, If the mean arterial blood pressure decreased by more than 20% below the pre-anesthetic value, an intermittent I/V injection of Ephedrine hydrochloride was given. Then we give low dose Ketamine with atropine or low dose opioids (Such as Pethidine/ Pentazocin/ Nalbupin/ Fentanyl) which is available before surgical incision. We can give also antiemetic drugs (vergon/ Emistat) H2 receptor blocker (Ranitidine/ Omeprazole) or atropine to decrease parasympathetic effects such as vomiting or secretion. Then after surgery started, we monitor the patient and managed accordingly with or, without sedative or hypnotic drugs. Thus balanced anaesthetic procedure continues.

Patients randomized to receive general anesthesia:

Induction was done by Propofol (2 to 3mg/kg) or T. P. S (5 mg / kg) with or without Fentanyl as premedication. Then intubation done by suxamethonium. Then in maintenance phase lungs were ventilated with Oxygen and Nitrous oxide gasses mixed with volatile anesthetic agent such as Halothane using a semi closed circle system. Ventilation was controlled with a tidal volume of 8 to 10 ml/kg. Then after completion of operation reverse was done by Neostigmin methylsulfate with atropine.

All patients were monitored continuously during the operation. Both clinical monitoring and instrumental monitoring done such as Pulse, BP, Respiratory rate, Cyanosis, Sweating, urine output, heart rate and oxygen saturation by pulse oxymeter recorded every 5 minutes interval. Post operatively Pain assessed by the visual analog scale and opioids group of drug given on demand. Post operative monitoring also done by clinical & instrumental monitoring.

Data Analysis:

The collected data analyzed by using SPSS program to arrive at a definite conclusion to the objective of the study.

Result:

Between August 2013 to December 2014, 80 patients entered our on going trail. They were randomized to have upper abdominal surgery under balanced anesthesia (n=40) or general anesthesia (n=40).

Table 1. Characteristics of patients undergoing upper abdominal surgery. Type of Anesthesia use

Characteristics	Balanced Anesthesia (n=40)	General anesthesia (n=40)
Age	25 to 60 years	30 to 65 years
Sex & No	F- 25 M- 15	F- 22 M- 18
ASA grading I & II	I - 20 II - 20	I - 15 II - 25
Body mass index median (range)	20 (15-25)	25 (20-30)
Operation time	40 minutes - 100 minutes (70 minutes)	50 minutes - 110 minutes (80 minutes)
Total anesthesia duration	50 minutes - 110 minutes (80 minutes)	60 minutes - 130 minutes (95 minutes)
Hospital stay	6 to 10 days (8 days)	8 to 12 days (10 days)

Comment:

Table-1 shows that the two groups were similar regarding demographics and physical characteristics.

Table 2. Cost of the therapy of patients undergoing Balanced Anesthesia and General anesthesia in upper abdominal surgery.

Balanced Anesthesia		General anesthesia	
Requirements	Cost	Requirements	Cost
Spinal needles	60/=	Endotracheal Tube	60/=
Inj.Bupivacaine	20/=	Inj.TPS / Propofol	90/=
Inj.Ephidrine	15/=	Inj.Suxamethonium	30/=
Inj.opioids / Ketamine	100/=	Inj.Vecuronium / Atracurionium	200/=
Inj.Vergon / Emistate	20/=	Inj.Neostigmine	40/=
		Gases (Oxygen, Nitrous oxide, Helothen) Per operation	1,500/=
		Inj.Fentanyl (As premedication)	100/=
Total cost	215/=	Total cost	2,020/=

Comment:

Table-2 shows that cost therapy of general anaesthesia about 10 times more than balanced anaesthesia.

Table 3. Operations performed of patients undergoing Balanced Anesthesia and General anesthesia in upper abdominal surgery.

Balanced Anesthesia		General anesthesia	
Name of operation	Number of operation	Name of operation	Number of operation
Cholecystectomy	10	Cholecystectomy	04
Cholidocholithotomy	05	Cholidocholithotomy	08
Nephrolithotomy	03	Nephrolithotomy	05
Pyelolithotomy	04	Pyelolithotomy	02
Gastrojejunostomy	03	Gastrojejunostomy	05
Partial gastrectomy	01	Partial gastrectomy	03
APR / Anterior resection	02	APR / Anterior resection	03
Appendisectomy	04	Appendisectomy	02
Splenectomy	01	Splenectomy	03
Repair of perforation	02	Repair of perforation	02
Abdominal Hysterectomy	03	Abdominal Hysterectomy	01
Oophorectomy	02	Oophorectomy	02
Total	40	Total	40
Name of operation	Number of operation	Name of operation	Number of operation

Comment:

Table-3 shows that more or less all upper abdominal surgery can be done by balanced anaesthesia as well as general anaesthesia.

Intra operative events related to surgical and / or anesthetic procedure presented in Table-4

Table-4 Intra operative adverse events

Adverse events	Received Balanced Anesthesia (N-40)	Received General Anesthesia (N-40)
Nausea/ vomiting	2	-
Sweating/ Tearing	-	2
Tachycardia/ Bradycardia	Bradycardia- 2	Tachycardia-2
Hypertension/ Hypotension	Hypotension- 4	Hypertension-2
SPO ₂ & HR (Pulse oxymeter)	SPO ₂ ↓ & HR ↓ - 2	SPO ₂ normal & HR ↑ 2
Muscle relaxation	Adequate	Good
Pain sensation	Profound Analgesia	Analgesia adequate
Surgeons statement	Same	Same

Comment:

Table- 4 shows that in intra operative period 10% patient developed hypotension in balanced anaesthesia and 5% patient developed hypertension in general anaesthesia.

Post operative events related to surgical and/ or anaesthetic procedure presented in Table- 5. Pain assessed by visual analog scale (VAS) was significantly less for balanced anaesthesia group at 2 hours, 4 hours, 6 hours and 8 hours post operatively and supplementary analgesic drugs was less required in post-operative period.

Table- 5 Post-operative adverse events:

Adverse events		Received Balance Anesthesia (No- 40)	Received General Anesthesia (No- 40)
Pain scores (VAS method)	At 2 hours	No pain (VAS 0 - 2)	Moderate pain (VAS 4 - 7) Analgesic drug required
	At 4 hours	Mild pain (VAS 2 - 4) Analgesic drug not required	Severe pain (VAS 7 - 9) Narcotic drug required

	At 6 hours	Moderate pain (VAS 4-7) Analgesic drug such as NSAID/ Ketorolac required	Moderate pain (VAS 4 - 7) 2nd dose of Analgesic drug such as NSAID/ Ketorolac required
	At 8 hours	Severe pain (VAS 7 - 9) Narcotic drug such as Pethidine/ Nalbuphin required	Severe pain (VAS 7 - 10) 2nd dose of narcotic drug required
Hypertension		Absent	Present-4
Tachycardia		Absent	Present-4
Urinary retention		Present-2 (relieved by catheterization)	Absent
Respiratory pattern		Normal	Not satisfactory y-4
Consciousness/ Recovery		Well alert	Not well alert-4

Comment:

Table-5 shows that post operative pain in balanced anaesthesia was less and delayed than general anaesthesia. Respiratory pattern and consciousness not satisfactory 10% patient of general anaesthesia.

N: B- By VAS Method- Secures (0 - 2) No pain, (2-4) Mild pain (4 - 7) Moderate pain, (7- 10) Severe pain, (>10) Worst pain

No pain	Mild pain	Moderate pain	Severe pain	Worst pain
0	2	4	7	10

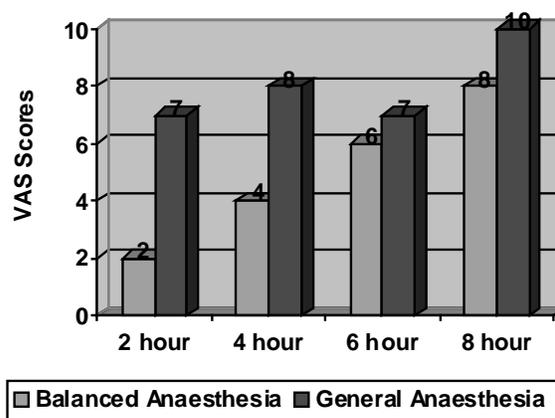


No Pain Mild Pain Moderate Pain Severe Pain Worst Pain

Statistical analysis of pain scores in post operative period by VAS method

Test Time	Balanced Anaesthesia (n=40)	General Anaesthesia (n=40)	P-value
At 2 hours	0(0-2)	2(0-7)	<0.001
At 4 hours	0(0-4)	3(0-8)	<0.001
At 6 hours	0(0-6)	2(0-7)	<0.001

Here statistical significance was seen as the level of the result of p-value <0.05



Bar presentation of pain scores in post operative period

Discussion

The Comparative analysis of our study shows that balanced anaesthesia was done better in patients with average body mass index and operation performed usually within 2 hours duration. Here cost therapy about 10 times lesser than general anaesthesia. Intraoperative events of note in balanced anaesthesia group include Bradycardia, Hypotension and Vomiting etc can easily overcome by giving intermittent administration of injection ephedrine hydrochloride and atropine with antiemetic drugs such as vergon or emistat etc. 2 Patients of balance anaesthesia group develop urinary retention that can be easily overcome by giving instant catheterization¹⁴.

The Comparative analysis of our study not only confirmed the feasibility of safely performing upper abdominal surgery under balanced anaesthesia as the sole anesthetic procedure but also

showed the superiority of balanced anesthesia in post operative pain control and good recovery compared with that of general anesthesia. Furthermore supplementary opioids were administered in significantly fewer patients having balanced anesthesia compared with those having general anesthesia. This difference could be attributed to a combination of several factors, the avoidance of endotracheal intubation related discomfort, the presence of adequate levels of analgesia for the first few hours after the completion of the surgical procedure owing to the existing activity of the analgesia injected in the subarachnoid space and the potentially minimal stress response associated with a minimal invasive anesthetic procedure, such as balanced anesthesia. Post operative pain control is probably the main factor that characterizes smooth recovery. On the other hand post operative pain in general anesthesia group of patient causes tachycardia and hypertension. Also due to pain patient take shallow and insufficient respiration which may cause cyanosis in general anesthesia group of patient. On the other hand in balanced anesthesia group of patient normal respiratory pattern persists¹⁵⁻¹⁶.

To the best of my knowledge, this is the first controlled randomized trial that compares the application of balanced anesthesia with general anesthesia in the average patient who undergoes elective open upper abdominal surgery. Moreover, it appears that balanced anesthesia is more effective than general anesthesia in post operative pain control during the patient's hospital stay. From these preliminary data, it appears that balanced anesthesia is a promising method of anesthesia for upper abdominal surgery and with proper refinements, it could potentially evolve as the new gold standard anesthetic approach for elective upper abdominal surgery in healthy patients¹⁷.

Conclusion:

The study finding that we got very much important. From this study it can be concluded that the outcome of patient's consciousness and pain control capacity is better in patient undergoing upper abdominal operations done by balanced anesthesia than general anesthesia in post

operative period. After four weeks follow up, the quality of life and patient's satisfaction scores were better in majority patients of balanced anesthesia group than general anesthesia group. No late complications were reported by telephone. So it can be recommended to use balanced anesthesia as an alternative of general anesthesia in our developing country especially in peripheral clinics where G/A machine with gasses not available because it is safe, cost effective, easy procedure and better analgesic effect with normal consciousness level persists in the post operative period.

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