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CHOLECYSTECTOMY;

COMPARISON OF TOTAL INTRAVENOUS ANESTHESIA WITH VOLATILE INDUCTION MAINTENANCE ANESTHESIA AT A TERTIARY CARE HOSPITAL IN KARACHI PAKSITAN

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ABSTRACT… Objectives: The aim of our study which is to compare total intravenous anesthesia with target controlled infusion using the drugs Propofol and remifenatnil with the techniques of volatile induction maintenance anesthesia using sevoflurane and sufentanil in patients undergoing laparoscopic cholecystectomy procedure, at a tertiary care hospital in Karachi, Pakistan. **Study Design:** The type of study is a randomized control trial, conducted for a period of 8 months **Period:** from June 2015 to January 2016 **Setting:** at a tertiary care hospital in Karachi Pakistan. **Method:** The patient population consisted of n=100 patients belonging to the ASA class I and II and undergoing laparoscopic cholecystectomy procedure at our institute. The patients were divided into two groups group A consisted of all those patients who underwent total intravenous anesthesia and group B consisted of patients who underwent volatile induction maintenance anesthesia. Appropriate blinding measures were taken for those who were involved in the post-operative care of the patients, and the patients themselves. During the procedure routine monitoring was done, data was recorded in a pre-designed proforma. Patients were analyzed in the post-operative period for side effects and pain levels. Statistical analysis was done using SPSS version 23, a p value of less than 0.05 was considered to be statistically significant. **Results:** The patient population consisted of n= 100 patients divided into two groups. No statistically significant difference was found between the demographic variables of the patients of both groups (age, weight, baseline values of blood pressure, heart rate, time duration of surgery and anesthesia). The time for the loss of corneal reflex was longer in the group A (109 +/- 90) as compared to group B (45 +/- 10) having a p value of less than 0.001. However the time for opening of the eyes and the duration of post anesthesia care unit was shorter in group A (420 +/- 130 seconds for eye opening and 45 +/- 15 min for PACU) and in group B (484 +/- 116 seconds for eye opening and 53 +/- 25 mins for PACU) having p values of 0.006 (eye opening) and 0.017 (PACU) respectively. In group A n= 44 (88%) of the patients required rescue analgesia, and in group B n= 36 (72%) of the patients required it, having a p value of 0.013 respectively. The need for the use of ephedrine and atropine in the pre and port operative period was similar in both the groups. **Conclusion:** According to the results of our study we found that each method of anesthesia has its own advantages and disadvantages and the anesthetist present should weigh the risks and benefits for each patient individually, and use the most beneficial method of administration of anesthesia in the patient undergoing laparoscopic cholecystectomy procedure, accordingly.

Key words: Total intravenous anesthesia, Propofol, volatile induction and maintenance anesthesia, sevoflurane, TIVA, VIMA.

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INTRODUCTION

Drugs that are short acting such as Propofol and remifenatnil are used as total intravenous anesthesia and provide good hemodynamic stability and recovery,[1] specially if used in ambulatory surgeries which require easy induction, control, fast recovery and minimal side effects. Utilizing these agents along with target controlled infusion which offers the added benefits of better regulation of plasma concentrations, increases the safety and produces predictable timings which is more efficacious. However in contrast

the gas Sevoflurane provides a low blood to gas partition coefficient, immediate induction, rapid emergence, better control of depth of anesthesia and good mask induction.[2] Sevoflurane is ideal in the pediatric population and patients with difficult airways.[3] Both afore mentioned drugs have been found to be excellent for use in surgical procedures of short duration, various studies have compared them for their properties of induction, anesthesia maintenance and recovery from the drug induced anesthesia. However total intravenous anesthesia (TIVA) with the use of target controlled infusion (TCI) using the drugs Propofol and remifenatnil as compared with the technique of volatile induction and maintenance anesthesia (VIMA) with the drugs sevoflurane and sufentanil has not been compared extensively, in the patients undergoing a laparoscopic cholecystectomy procedure. To which effect is the aim of our study which is to compare TIVA with TCI using the drugs Propofol and remifenatnil with the techniques of VIMA using sevoflurane and sufentanil in patients undergoing laparoscopic cholecystectomy procedure, at a tertiary care hospital in Karachi, Pakistan.

MATERIALS AND METHODS

The type of study is a randomized control trial, conducted for a period of 8 months from June 2015 to January 2016 at a tertiary care hospital in Karachi Pakistan.

The patient population consisted of n=100 patients belonging to the ASA class I and II, between the ages of 16 and 65 years, gave fully informed consent to participate in the study and undergoing laparoscopic cholecystectomy procedure at our institute. The exclusion criteria was all the patients, who refused to participate, were outside the defined age range, had severe co morbidities like respiratory, cardiovascular, allergies to agents used in the study, history of drug abuse etc.

The patients were divided into two groups using a random number generator. Group A consisted of all those patients who underwent total intravenous anesthesia and group B consisted of patients who underwent volatile induction maintenance anesthesia. Appropriate blinding measures were taken for those who were involved in the post-operative care of the patients, and the patients themselves. During the procedure routine monitoring was done measuring the patients, blood pressure, heart rate and pulse oximetry. A gas analyzer was utilized to measure the patient's oxygen and carbon dioxide concentrations along with the gas sevoflurane. All the patients who received total intravenous anesthesia were infused with ringers lactate solution at 10ml per kg through an intravenous catheter, were pre oxygenated with oxygen at 3 liter per min for 3 minutes prior to the start of anesthetic medications via a target controlled infusion (TCI) pump. The drugs were set at a target concentration of 3 ug/ml for Propofol and 6ng/ml for remifenatnil during the induction phase and were maintained at 2-3 ug/ml for propofol and 2-6ng/ml for remifenatnil, according to the patient's hemodynamic status.

The patients were checked for loss of corneal reflex before intubation after 3minutes of administration of drugs with concurrent dose of vecuronium at 0.1mg per kg. In group B, the gas flow of anesthesia was set at 5 liter per minute of oxygen with 8% vaporization of sevoflurane, the patients were taught the vital capacity breath technique. Upon loss of the corneal reflex sufentanil 0.3 ug per kg and vecuronium as 0.1 mg per kg were given, afterwards the gas flow was maintained at 2 liter per minute. Endotracheal sevoflurane 2% was administered for duration of 3 minutes, followed by endotracheal intubation procedure. When done with the ETT the end tidal concentration of sevoflurane was set at 1.3 to 2.2% accordingly. Intravenous perdipine 0.2mg or esmolol 5mg were used whenever patients showed signs of hemodynamic instability (mean arterial pressure value of 20% above the established base line for a duration of longer than 1 min and/or tachycardia for more than 1 minute). Intravenous ephedrine 6mg or atropine 0.3mg were administered when patients showed signs of decreased MAP and bradycardia (less than 20% of baseline, of less than 50 beats per minute heart rate). All the drugs in the study were administered till the end of the procedure, ETT extubation was done when normal breathing resumed.

After the surgical procedure the patients were transferred to the recovery room, where patients pain levels were monitored using a visual analog scale and fentanyl 30ug was administered when the pain levels were recorded to be more than 5, and the required number of dosages duly noted. Data was analyzed using SPSS version 23, numerical data was expressed as means and standard deviations and/or frequency and percentages when required. Two tailed student t test was used to analyze the continuous variables and fisher exact test was used to analyze the qualitative variables. A p value of less than 0.05 was considered to be statistically significant.

RESULTS

The patient population consisted of n= 100 patients divided into two groups using a random number generator. The Group A (TIVA group) consisted of n= 50 patients who received total intravenous anesthesia, while Group B (VIMA) group consisted of n=50 patients who received volatile induction maintenance anesthesia. No statistically significant difference was found between the demographic variables of the patients of both groups (age, weight, baseline values of blood pressure, heart rate, time duration of surgery and anesthesia) refer to Table-I. The time for the loss of corneal reflex was longer in the group A (109 +/- 90) as compared to group B (45 +/- 10) having a p value of less than 0.001. However the time for opening of the eyes and the duration of post anesthesia care unit was shorter in group A (420 +/- 130 seconds for eye opening and 45 +/- 15 min for PACU) and in group B (484 +/- 116 seconds for eye opening and 53 +/- 25 mins for PACU) having p values of 0.006 (eye opening) and 0.017 (PACU) respectively. In group A n= 44 (88%) of the patients required rescue analgesia, and in group B n= 36 (72%) of the patients required it, having a p value of 0.013 respectively. The dosages required of analgesia are as follows, 30ug [group A= 10 (20%), group B= 22 (44%), p value of 0.027], 60ug [group A= 19 (38%), group B= 11 (22%), p value of 0.166], 90ug [group A= 15 (44.11%), group B= 3 (6%), p value of 0.001]. Incidence of nausea and vomiting was higher in group B 20% (VIMA) as compared to group A 38% (TIVA), having a p value of 0.027 respectively. The need for the use of ephedrine and atropine in the pre and port operative period was similar in both the groups.

Characteristic	Group A (TIVA)	Group B (VIMA)
Age in years	44 +/- 10	42 +/- 12
Weight in kg	62 +/- 10	64 +/- 8
Gender		
Male	32 (64%)	30 (60%)
Female	18 (36%)	20 (40%)
Baseline blood pressure (mm of Hg)	81 +/- 9	83 +/- 10
Baseline heart rate (beats per minute)	73 +/- 10	74 +/- 12
Duration of surgery (min)	44 +/- 12	43 +/- 16
Duration of anesthesia (min)	57 +/- 15	55 +/- 17

Table-I. Demographic variables of the two groups of patients studied.

DISCUSSION

According to the results of our study, it was observed that the anesthesia methods of TCI with propofol and remifenatnil as total intravenous anesthesia and sevoflurane as volatile induction maintenance anesthesia were both effective and had good results when used for a procedure of short time duration. Both the methods were well tolerated by the patient population, however VIMA with sevoflurane provided a faster induction, and hence faster ETT intubation and airway control, which is also reported by other studies.[4] But this is also dependent on several other factors such as the effective potency of the gas, the method of induction utilized, priming of the circuit with sevoflurane and the backward flow chosen.[5,6] In contrast when it comes to recovery time, remifenatnil and propofol were faster, because of the immediate removal of remifenatnil, in contrast to the slow exhalation of sevoflurane (which also had side effects of nausea and vomiting in the recovery room post-surgery, and needed to be addressed). Post-operative analgesic requirement was found to be more in the TIVA group, which could be due to the fact that in our study we had used a short acting opioid in

remifenatnil and because of the shorter half life, high doses and a longer term of use could have prone the patient to an increased sensation of pain.[7] The post-operative nausea and vomiting is an important factor, and it is believed that its incidence is related to the amount of postoperative opioid uses.[8] In our study, even though the TIVA patients required more post-operative analgesic the incidence of nausea and vomiting was lower in that group, which could be attributed to the antiemetic properties of propofol, and that sevoflurane is known to cause higher incidence of post-operative nausea and vomiting.[9,10] It is recommended that patients receiving sevoflurane be also administered antiemetic to decrease the incidence of post-operative nausea and vomiting. It is also well established that the use of auditory evoked potential can be used to judge the depth of sedation during the sevoflurane anesthesia, but in our study we did not use this and other available methods due to the lack of resources in a third world country like Pakistan.[11,12] We also used sufentanil at 0.3 ug per kilogram which can inhibit the noxious stimuli of ETT intubation, incision and CO2. In the late phases of the procedure sufentanil effect was decreased and we relied on sevoflurane to maintain the anesthesia. The effective concentration of sevoflurane as measured in the endotracheal tube should be 4.1%, however we did not use higher concentrations as that may pre dispose the patient to develop hypotension and hemodynamic instability.[13] In our experience induction combined with sufentanil administration was effective and sufficient to produce the desired analgesia and anesthesia. The limitation of our study was that we did not use auditory evoked potential monitors etc to measure the depth of anesthesia reliably, and further studies done could eradicate this dearth.

CONCLUSION

According to the results of our study we found that each method of anesthesia has its own advantages and disadvantages and the anesthetist present should weigh the risks and benefits for each patient individually, and use the most beneficial method of administration of anesthesia in the patient undergoing laparoscopic cholecystectomy procedure, accordingly.

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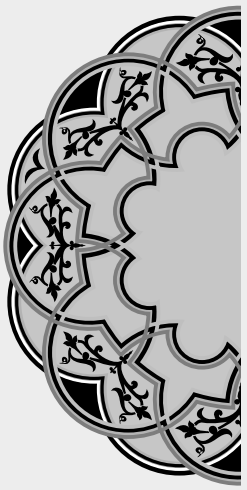

"Still waters run deep."

English Proverb

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
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2	Dr. Hamid Raza	Write up, statistical analysis, drafting, corresponding author	
3	Dr. Kamlaish	Data collection, write up, analysis literature review	