Original Article

Hemodynamic Stability in Day Care Surgery

What to be Used for Hemodynamic Stability in Day Care Surgery - Laryngel Mask Airway or Endotracheal Tube

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ABSTRACT

Objective: To compare the haemodynamic changes between Laryngeal Mask Airway (LMA) insertion & Endotracheal intubation in day care surgery.

Study Design: Quasi Experimental Study.

Place and Duration of Study: This study was conducted at the Department of Anaesthesia, Divisional Headquarter Teaching Hospital Mirpur from May 2015 to May 2016.

Materials and Methods: This study was conducted after taking permission from the Hospital Ethical Committee. One hundred patients fulfilling inclusion criteria were selected by non probability convenient sampling after taking informed written consent. They were divided into two groups (LMA-A and ETT- B) scheduled for different elective day care surgical procedures under general anaesthesia. Group A comprised of fifty patients in whom LMA was inserted. Group B comprised of fifty patients in whom ETT was inserted. Patient ' s systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR) and pulse oximetry (SPO2) baseline and on 01,03,05,07,09 than after every three minutes were recorded. All the data compared and analyzed by SPSS-10.

Results: It was observed that 99% i.e. forty-eight patients of group A (n=50) did not show intraoperative hemodynamic changes and only 1% i.e.2 patients showed hemodynamic changes. While 95% i.e. forty patients of group B (n=50) did not show hemodynamic changes and remaining only 5% i.e. 10 patients showed intraoperative hemodynamic changes.

Conclusion: The use of LMA significantly reduces the intaoperative hemodynamic changes compared to ETT in day care surgery.

Key words: Laryngeal mask airway, Endotracheal tube, Hemodynamic changes, day care surgery

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INTRODUCTION

There is an explosion in the number of day surgery procedures conducted in both developed and developing countries. The advances in anaesthesia, surgery and monitoring technology have allowed increasingly complex surgeries being performed on patients even with multiple comorbidities[1,2]. Haemodynamic stability is an important aspect to the anaesthesiologist for the benefit of the patients especially during laryngoscopy, intubations and laryngeal mask insertion. It can cause striking changes in Hemodynamics as a result of intense stimulation of sympathetic nervous system.

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We have attempted to compare the use of LMA with ETT to establish a truth that which one is superior regarding intraoperative hemodynamic stability in patients reported to our teaching hospital for Day Care Surgery as minimal changes have marked effects on patients with cardiac and cerebral diseases.

Day case surgery: Patients are discharged from the hospital on the day of procedure taking approximately less than 60 minutes to complete with no severe hemorrhage or postoperative pain[10]

MATERIALS AND METHODS

After approval from hospital ethical committee, this quasi-experimental study was conducted in the Department of Anaesthesiology Divisional Headquarter Teaching Hospital Mirpur Azad Kashmir from May, 2015 to May, 2016. One hundred patients, all normotensive non diabetic and having average built belonging to ASA-I ranging from 20-60 years ,both Male/Female, categorized in Mallampatti I and II candidate for Day care surgery selected by non probability convenient sampling were included in study after taking informed written consent. While Patients with Emergency surgery, Difficult airway (mallampatti III and IV), Cardiovascular diseases (Hypertension, IHD, etc) Respiratory diseases(COAD,ILD,etc) and Patients with full stomach were excluded from the study.

They were divided into two groups (LMA-A and ETT- B) scheduled for Day care surgery under general anaesthesia. Group A comprised of fifty patients in whom LMA was inserted. Group B comprised of fifty patients in whom ETT was placed. The conduct of anaesthesia was kept same in both the groups.

Regarding group description and sampling technique, the technique devised was non probability convenience sampling. Patients were divided into two groups on the basis of even and odd numbers i.e., from number 1--99, all the odd numbers were taken as group A(1-3-5-7---99) and all the even numbers were taken as group B (2-4-6-8---100). Patients were assessed pre-operatively for anaesthesia and surgery. On arrival in operation theatre venous access was secured and monitoring of base line parameters including, non-invasive blood pressure NIBP, mean arterial pressure MAP, heart rate HR, pulse oximetry SpO_2 and ECG were started. Conduct of anaesthesia in both groups was kept similar which included pre-oxygenation with 100% oxygen for three minutes, injection nalbuphin 5mg, propofol 2mg/kg atracurium 0.5mg/kg, followed by insertion of LMA or tracheal intubation, intermittent positive pressure ventilation and isoflurane 1%. Patient's systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR) and pulse oximetry (SpO_2) were recorded on 1,3,5,7,9 minutes and after every three minutes thereafter.

Average values of SBP, DBP, MAP, HR and SpO_2 of each case was determined and more than twenty five percent increase in either pressure (SBP, DBP or MAP) value from baseline or HR more than 100 bpm was considered as a hemodynamic change. Twenty five percent increase in baseline blood pressure was Considered as intraoperative hypertension while heart rate more than 100 beats per minutes. Average value of each indicator was determined and the data compared and analysed by SPSS-10.

RESULTS

In this study a total of 100 cases were enrolled divided into 50 randomly allocated to LMA and ETT study groups. In the study one hundred cases were studied with minimum age of twenty years and maximum sixty years. The . Data was entered in SPSS version 10.0 for analysis. Mean ± S.D was calculated for quantitative variables such as age, SBP, DBP, MAP and HR (hemodynamic changes). Frequencies and percentages was presented for qualitative variables such as gender and mallampatti classification. Chi-square test was used to compare the hemodynamic changes in both the groups. A P-value of <0.05 was considered statistically significant. Correlation coefficient was used to check the interdependence between them.

The study constituted sixty eight male and thirty two female patients , with percentage distribution of 68% and 32% respectively . These are shown in Table-7

As per study objective we calculated the blood pressure of the study patients before and after the use of LMA and ETT insertion. The mean baseline systolic blood pressure in both LMA and ETT study groups was 126.4 ± 14.2 mmHg. After the insertion the mean systolic blood pressure in LMA study group was 135.1 ± 18.0 mmHg and in ETT study group it was 143.7 ± 24.7 mmHg. The mean change in the systolic blood pressure after the insertion of LMA was 8.5 mmHg while in the ETT group it was significantly high with average of 17.3 mmHg. (Table 1).

Similarly we calculated the mean and standard deviations for diastolic blood pressure (DBP) changes in both study groups. The baseline DBP in the LMA and ETT study groups was 74.8 ± 9.5 mmHg each. After the insertion the mean diastolic blood pressure in LMA group was 82.6 ± 11.0 mmHg while in ETT study group it was 90.0 ± 19.6 mmHg. The change was almost double in ETT group. The average change in the mean DBP in LMA group was 7.84 mmHg and in ETT group it was noted to rise to 15.0 mmHg on average. (Table 2).

The mean arterial pressure (MAP) was also observed before and after intervention in both study groups. The mean MAP before insertion of LMA or ETT was 116.6 ± 12.3 each. After insertion the mean ± SD MAP in LMA group was 116.7 ± 16.5 and mean change of 0.24 from baseline. In the ETT group it was noted as 120.9 ± 16.9 with mean change in MAP of 4.80. Thus proving the mean MAP raised more in the ETT group compared to LMA group. (Table 3)

The pulse oximetry changes in the study groups before and after intervention were calculated. The mean SpO_2 before intervention in both study groups was 98.5 ± 1.5. After administration of intervention it noted to be 98.3 ± 1.8 in LMA group while 98.2 ± 1.5 in the ETT study group. The mean drop in SpO_2 was slightly greater in LMA study group with -0.60 when compared with ETT -0.26. (Table 4)

The change in the heart rate was also observed. The baseline mean ± heart rate in both study groups were noted to be 82.3 ± 11.1. After the insertion the mean ± SD heart rate in LMA study group was 89.5 ± 12.0. While in the ETT study group it was noted to be 94.5 ± 18.9. The change in the mean heart rate was noted almost double in the ETT study group with 12.10 compared to 7.60 in the LMA group. (Table 5)

The overall hemodynamic changes in both study groups were compared. In the LMA study group out of 50 patients in 2 (4.0%) cases hemodynamic change was observed and in 48 (96.0%) there was no hemodynamic change.

Table No.1. Gender distribution (n = 100) - Change in the systolic blood pressure of patients in both study groups

	SBP(baseline) (Mean ± SD)	SBP after insertion (Mean ± SD)	Mean change in SBP
Group A LMA(n=50)	126.4 ± 14.2	135.1 ± 18.0	8.54
Group B ETT (n=50)	126.4 ± 14.2	143.7 ± 24.7	17.30

Table No.2: Change in the diastolic blood pressure of patients in both study groups

	DBP (baseline) (Mean±SD)	**DBP after insertion** (Mean±SD)	**Mean change in DBP**
Group A LMA (n=50)	74.8 ± 9.5	82.6 ± 11.0	7.84
Group B ETT (n=50)	74.8 ± 9.5	90.0 ± 19.6	15.0

Table No.3: Change in the mean arterial pressure of patients in both study groups

	MAP (baseline) (Mean±SD)	**MAP after insertion** (Mean± SD)	**Mean change in MAP**
Group A LMA (n=50)	116.6±12.3	116.7 ± 16.5	0.24
Group B ETT (n=50)	116.6±12.3	120.9 ± 16.9	4.80

Table No.4: Pulse oximetry changes in patients in both study groups

	SpO_2 (baseline) (Mean±SD)	**SpO_2 after insertion** (Mean±SD)	**Mean change in SpO_2**
Group A LMA (n=50)	98.5 ± 1.5	98.3 ± 1.8	-0.60
Group B ETT (n=50)	98.5 ± 1.5	98.2 ± 1.5	-0.26

Table No.5: Change in the heart rate of patients in both study groups

	HR (baseline) (Mean±SD)	**HR after insertion** (Mean± SD)	**Mean change in HR**
Group A LMA (n=50)	82.3 ± 11.1	89.5 ± 12.0	7.60
Group B ETT (n=50)	82.3 ± 11.1	94.5 ± 18.9	12.10

Similarly in the ETT study group out of 50 patients hemodynamic changes in 10 patients (20.0%) were noted while in 40 (80.0%) cases there was no change. The difference in hemodynamic change in both study groups was found statistically significant (p-value = 0.02). (Table 6).

Table No.6: Comparison of hemodynamic changes observed in both study groups

	Group A LMA (n=50)	**Group B ETT** (n=50)	**p-value***
Change in hemodynamics	2 (4.0%)	10 (20.0%)	0.02
No change in hemodynamics	48 (96.0%)	40 (80.0%)	

* Fisher's exact test value because of low proportions

DISCUSSION

Hemodynamic changes remain a high concern for both patients and anaesthesiologists during intubation and surgery. Numerous methods, techniques and number of drugs have so far been used for this purpose with variable results.[11] Perioperative use of LMA or ETT have variable results with respect to hemodynamic changes and respiratory complications. These results are quite comparable. Many studies shows that perioperative use of LMA has less hemodynamic changes than ETT while some studies shows no significant difference. [12]

In my study the group of patients in which LMA was used has significantly less hemodynamic changes as compared to that group of patients in which ETT was used. In all the patients in which hemodynamic changes were observed along with SBP, DBP, HR also changed but no marked change seen in SpO_2 (less than 90%). This shows that ETT has more effect on cardiovascular physiology than that of LMA insertion during induction, maintenance and emergence of anaesthesia while there is no significant difference regarding changes in respiratory physiology by both the devices of airway management. But transient laryngospasm or bronchospasm cannot be ruled out which by prompt treatment often do not cause oxygen desaturation.[13] As P value is 0.02 less than 0.05 which denotes that there is a significant difference of hemodynamic changes in both the groups.

Many studies were conducted comparing LMA and ETT regarding the different aspects like hemodynmic changes, incidence of laryngospasm, in various types of surgery, co-morbid conditions , for positive pressure ventilation and resuscitation. In a study done by Idrees A, Khan FA in the Department of Anaesthesia, Aga Khan University Hospital, Karachi it is concluded that the use of LMA during positive pressure ventilation is safe in selected cases[14].

There is an attenuated haemodynamic response to insertion of LMA as compared to endotracheal tube which will be beneficial in certain patients e.g., those with ischemic heart disease, vascular disease and hypertensives [14] It shows that former has priority over the later which is in favour of our study. In another study conducted by Jacob DB, Hirshman CA, it was found that the incidence of cough, secretions and breath holding was lower with LMA but the difference was not statistically significant. The incidence of laryngospasm was equal in both the groups. The difference in incidence of SpO_2 desaturation and bronchospasm was statistically significant with LMA showing a lower incidence. It was concluded that children with mild URI may be taken up for surgery with a little extra caution and extending the observation of children till the stay in the PACU and LMA definitely offers a suitable alternative to ETT in paediatric patients with URI.[15]

This study again goes in our favor. Banzhaf A, Junger A, Röhrig R, Benson M, Schürg R and Hempelmann G conducted a study in the Department of Anesthesiology, Intensive Care, and Pain Therapy, University Hospital, Giessen, Germany and found that anesthesia induction was significantly shorter using LMAs as compared to ETT whereas emergence from anesthesia was not different.They concluded that the clinical relevance of reduced anesthesia induction time using LMA is questionable. The lack of difference in emergence time could be a result of the use of total intravenous anesthesia.[16]

In a study conducted by Tanaka A, Isono S, Ishikawa T, Sato J and Nishino T in Graduate School of Medicine, Chiba University, Japan it was concluded that the postoperative laryngeal resistance increases at least in part because of laryngeal swelling in patients with ETT placement, whereas alteration of laryngeal neural control mechanisms has been also indicated. The use of the LMA trade mark has an advantage over ETT placement in order to avoid postoperative laryngeal swelling. The post operative laryngeal swelling may lead to oxygen desaturation and ultimately hemodynamic changes.[17] There was a another study conducted by Ferson DZ, Nesbitt JC, Nesbitt K, Walsh GL, Putnam JB Jr, Schrump DS, Johansen MJ, Jones R and Roth JA in the department of Anesthesia, University of Texas M. D. Anderson Cancer Center, Houston, USA on the laryngeal mask airway, a new standard for airway evaluation in thoracic surgery.[18] They concluded that insertion of the LMA causes minimal hemodynamic response. From the time of induction of general anesthesia, insertion of the LMA is quick, simple, and safe and eliminates the need for endotracheal intubation with a single-lumen ETT before double-lumen tube insertion. The LMA, in contrast to the ETT, allows a complete survey of the larynx and trachea. Again this study gives strength to our study.[19,20]

Patients were selected according to the inclusion criteria and in all patients LMA was inserted or trachea was successfully intubated in first attempt . The anaesthetic technique was very consistent .The whole pre-operative and intra-operative management was done by same anaesthesiologist, thus the anaesthetic technique was pre-fixed and this excluded any bias into this study. Similar conduct of anaesthesia in both study groups selected randomly, total data collected (each parameter) by single anaesthesiologist, wide range of age group and noninvasive simple parameters required , give strength to my study results. Whereas, elective day care surgical procedures of short duration limited number of patients, gender and ASA group are limitations of my study. Inspite of these limitations the results of my study are quite comparable with international studies.

CONCLUSION

Smooth and controlled anaesthesia is goal of anaesthesiologst which can only be achieved by ensuring hemodynamic stability during induction, maintenance and emergence from anaesthesia.

There is a significant difference regarding hemodynamic changes with the use of LMA as compared to ETT during intubation and maintenance of anaesthesia in day care surgical procedures. Thus insertion of LMA is proved to be superior to ETT regarding hemodynamic changes. There were less or no additional measures required to ensure hemodynamic stability i.e. volatile agents, intravenous drugs with the use of former than the later. It is recommended that LMA should be used instead of ETT for intubation and maintenance of anaesthesia in Day care surgery however the risk of respiration is still to be more worked out.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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