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Ultra-Fast Tracking in Anaesthesiology- During Surgery for Atrial Septal Defect (Asd) Closure Using Laryngeal Mask Airways

Medical Science

KEYWORDS : laryngeal mask airway, ASD closure, fast track

Dr Madhusoodana R Bhovi	Assistant Professor, Department of Anesthesia, A.J.Institute of Medical sciences, Mangalore.
Dr Shridevi A.S.	Associate Professor, Department of OBG, SSIMS&RC, Davangere
Dr A.M.Jagadeesh	Professor and HOD, Department of Anesthesia, SJIC, Bangalore

ABSTRACT

Recently there has been much interest in early extubation following cardiac surgery, in an attempt to decrease cost of it and to reduce length of hospital stay. One popular strategy known as fast tracking uses modified anesthetic management that facilitates early ET extubation at 1 to 6 hours after surgery. Therefore, we have undertaken a protocol to determine the possibility of avoiding post operative ventilation in patients undergoing ASD closure surgeries under CPB with the use of short/intermediate acting drugs and laryngeal mask airways.25 patients undergoing ASD closure surgery were studied. Premedicated with Morphine 0.1 mg/kg i.m.1/2 an hr before surgery Or Ketamine 5mg/kg i.m. before surgery in children. Induced with fentanyl 3 mics/kg i.v.Vecuronium-1-1.5 mg/kg i.v. Propofol 0.5 mg/kg i.v. Midazolam 0.05 mg/kg Airway maintained with LMA. Maintenance-Fentanyl 1-5 mics/kg i.v, Propofol 0.05-0.1 mg/kg i.v.,Atracurium-10mics/kg/min. Conclusions-Early extubation using short/intermediate acting drugs and LMA is a safe method in uncomplicated cardiac surgical procedures.

INTRODUCTION- Recent trends in health care focused attention on cost. The economic constraints has encouraged the minimization of postoperative intensive care and has induced the anesthesiologists to alter their practice accordingly.[1]So there has been much interest in early extubation or fast track anaesthesia following cardiac surgery.[2, 3] One popular strategy uses modified anesthetic management that facilitates early ET extubation at 1 to 6 hours after surgery. This approach has proved to be safe and cost beneficial by reducing ICU stay and has been successfully adopted.[4, 5]

Laryngoscopy and endotracheal intubation is the commonest method of securing a definitive airway for administering anaesthesia. However it is associated with tachycardia and hypertension and an increase in intraocular pressure.[6] These changes have been observed to be associated with rise in plasma noradrenaline levels, confirming a predominantly sympathetic response to it.[7]

The laryngeal mask airway (LMA) was developed by British anaesthetist Dr Archie I. J. Brain in 1983. LMA was approved by the FDA in 1991, and its use in airway management has been gaining popularity ever since. Insertion of laryngeal mask airway requires neither the visualization of cords nor the penetration of larynx, making the placement less stimulating than tracheal tube insertion and it may provoke less sympathetic response and catecholamine release. Therefore during laryngeal mask airway insertion there is less likelihood of pressor responses or coughing than with conventional endotracheal tube anaesthesia and as a consequence the increase in intraocular pressure may be diminished. It is relatively non-invasive as compared to endotracheal intubation and causes minimal disturbances in cardiovascular and respiratory system. [8] Formerly, use of LMA was limited to those patients with difficult airways but now it is popular for all cases of general anaesthesia unless contra-indicated. Ease of insertion and removal makes the LMA an appealing alternative to tracheal intubation in some circumstances. [9]In addition, the LMA may facilitate airway management when conventional tracheal intubation is either difficult or impossible.[10]

The tracheal intubation and extubation is known to cause hemodynamic disturbances. Avoidance of intubation and post-op ventilation in appropriate patients would make this procedure ideal for fast-tracking Therefore we have undertaken a study to determine the possibility of avoiding post-op ventilation in patients undergoing ASD closure surgeries under CPB with the use of LMA.

MATERIALS & METHODS

STUDY POPULATION -25 patients undergoing ASD closure surgery under CPB were included in the study after ethical committee approval and informed consent.

INCLUSION CRITERIA- Age between 5 & 40 yrs, ASA grade II&II, EF>50% undergoing elective procedure.

EXCLUSION CRITERIA- Obesity, COPD, Gastric reflux, when TEE was planned, pulmonary hypertension, Hypersensitivity to Opiods & propofol

PROCEDURE- Pre anesthetic check up done for all patients. Investigations including complete hemogram, BUN, Creatinine, CXR, ECG, and Echo. Intraoperative monitoring ABP, SpO2, ETCO2, Temperature, ECG, CVP, ACT

PROTOCOL OF THE STUDY-All the patients in the study were followed following protocol-

1. Premedication- Morphine 0.1 mg/kg ½ an hr before surgery, Ketamine 5mg/kg i.m. before surgery in children
2. INDUCTION- Glycopyrrolate-0.005mg mg/kg i.v, Xylocard 1mg/kg i.v, Fentanyl 3 mics/kg i.v, Midazolam 0.05mg/kg i.v. Propofol 1mg/kg IV, Vecuronium-0.1mg/kg i.v
3. Airway established with LMA and position confirmed.
4. MAINTENANCE- fentanyl 1-5 mics/kg/hr i.v. Infusion, Propofol 50mics/kg/min i.v infusion, Atracurium 0.5 mg/kg/hr Infusion.Hypotension in general was treated with volume replacement and phenylephrine bolus 20 mics.
5. Management during the Cardiopulmonary Bypass(CPB)- During Prebypass period Anticoagulation achieved with Heparin 3mg/kg and additional doses given (if required) to maintain ACT>480.Bypass period -Standard CPB with-Membrane oxygenator with continuous flow of 2-2.4 L/min/m^2Antegrade warm cardioplegia used.There was no active cooling.Termination of CPB done after rewarming to 37° C and with the criteria of stable rhythm, adequate HR of 80-100,no acidosis and electrolyte imbalance and hemato-

crit>20-25%. During weaning from CPB ventilation resumed with 100% oxygen and inotropes,vasodilators were used as required. Protamine-1.3mg/100 units of heparin was given during postbypass period to maintain ACT<120.

6. FENTANYL, PROPOFOL, ATRACURIUM INFUSIONS were stopped just after closure of sternotomy.Bupivacaine 0.25% infiltration done to facilitate skin closure.
7. Extubation- Neostigmine 0.08mg/kg+Glycopyrrolate 0.05mg/kg used as reversal before extubation.

OBSERVATIONS

1. CPB time, cross clamp time, time to extubate were noted
2. Baseline HR,SBP,DBP were noted.HR,SBP,DBP were noted before the insertion,1,2,3 minutes after the insertion, 1,2,3 minutes after the removal of LMA.

STATISTICS-Changes in HR, SBP, and DBP were compared to the baseline using Student t-test (paired)

RESULT-

In our study 18 patients were extubated on operating table with stable hemodynamics, whereas 2 of them got reintubated in recovery, remaining 5 got extubated in recovery room. Table 1 Age, weight, height of patients in the study group. The mean age in yrs was 19.68±7.99. Table 2 shows Age distribution.

Table 1: analysis of age,height,weight

Parameters	Minimum	Maximum	Mean	SD
AGE	5	35	19.68	7.99
HT	120	170	153.00	11.18
WT	15	61	43.36	11.73

Table 2: Age distribution

Age in years	Number	%
≤ 10	2	8.0
11-20	12	48.0
21-30	8	32.0
>30	3	12.0
Total	25	100.0
Mean ± SD	19.68 ± 7.99	

Table 3 shows the mean CPB time was 41.64±6.47 mins and table 4 shows the mean cross clamp time 24.50±5.87 mins Table 5 shows that mean time of extubation was 39.76±24.53 mins.

Table 3: CPB time

CPB time(in mins)	Number	%
≤ 30	1	4.0
31-40	12	48.0
41-50	10	40.0
>50	2	8.0
Total	25	100.0
Mean ± SD	41.64± 6.47	

Table 4: Cross clamp time

Cross clamp time(in mins)	Number	%
≤ 20	10	40.0
21-30	11	44.0
>30	4	16.0
Total	25	100.0
Mean ± SD	24.50± 5.87	

Table 5: Time for Extubation

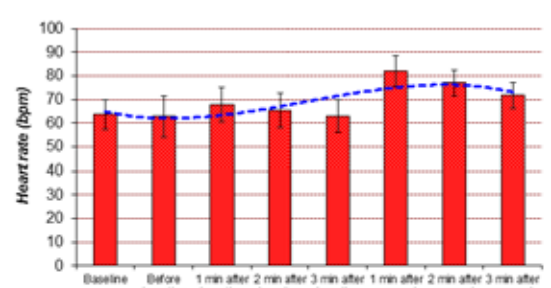
Time to Extubation(in mins)	Number	%
≤ 20	5	20.0
21-30	5	20.0
31-40	7	28.0
41-50	3	12.0
>50	5 20.0	
Total	25	100.0
Mean ± SD	39.76± 24.53	

Table 6 and the Figure 1 shows the pattern of the HR before and after the insertion of the LMA.The mean HR was significantly higher at 1 min after insertion and 1,2,3 min after removal of LMA. Table 7 and the Figure 2 shows the pattern of the SBP before and after the insertion of the LMA. The mean SBP was significantly lower before insertion and 3 min after insertion of LMA. Table 8 and the Figure 3 shows the pattern of the DBP before and after the insertion of the LMA .The mean DBP significantly lower before insertion of LMA.

Table 6: Mean pattern of HR

Hear rate (bpm)	Minimum	Maximum	Mean	SD	P value
Baseline	50	74	63.60	6.28	-
Before Insertion	51	79	62.84	8.68	0.489
1 min after Insertion	56	80	67.76	7.35	<0.001**
2 min after insertion	54	78	65.40	7.25	0.062+
3 min after insertion	52	75	62.88	6.89	0.504
1 min after removal	70	94	82.16	6.50	<0.001**
2 min after removal	68 90		77.00	5.42	<0.001**
3 min after removal	60	80	71.72	5.52	<0.001**

Figure 1; Mean pattern of HR



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Table 7: Mean pattern of SBP

SBP (mm Hg)	Minimum	Maximum	Mean	SD	P value
Baseline	110	142	122.56	9.89	-
Before Insertion	107	124	115.08	4.66	<0.001**
1 min after Insertion	112	128	118.56	4.18	0.036*
2 min after insertion	110	122	114.64	3.89	<0.001**
3 min after insertion	104	118	109.60	3.23	<0.001**
1 min after removal	113	140	128.16	7.56	0.039*
2 min after removal	110	128	117.40	4.80	0.022*
3 min after removal	104	126	112.88	5.00	<0.001**

Figure 2; Mean pattern of SBP

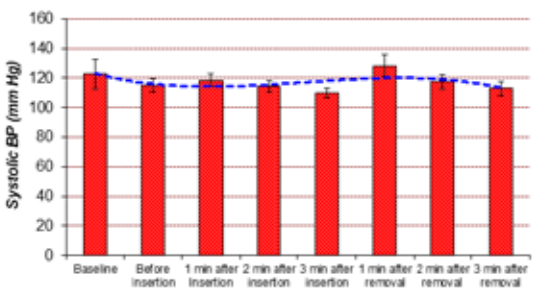
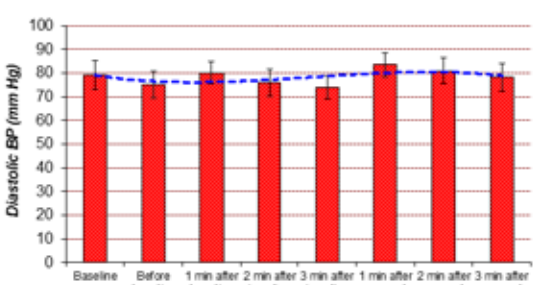


Table 8: Mean pattern of DBP

DBP (mm Hg)	Minimum	Maximum	Mean	SD	P value
Baseline	68	89	79.04	6.09	-
Before Insertion	65	85	75.12	5.73	<0.001**
1 min after Insertion	65	85	80.20	4.50	0.443
2 min after insertion	64	86	76.16	5.68	0.074+
3 min after insertion	66	84	73.96	4.95	0.002**
1 min after removal	75	95	83.48	5.03	0.007**
2 min after removal	70	90	81.00	5.62	0.225
3 min after removal	69	87	78.20	5.80	0.629

Figure 3; Mean pattern of DBP



DISCUSSION- The study conducted by Bennett et al[11] concluded that LMA allows airway management without hypertension and tachycardia and should be considered when anaesthetizing patients with coronary disease. They used the LMA in 22 patients undergoing coronary artery bypass grafting (CABG) and they randomly grouped into laryngoscopy and tracheal intubation, tracheal intubation via the ILMA or the LMA. One patient required intubation after cardiopulmonary bypass because mechanical ventilation was difficultWith the LMA, HR and MAP were stable whereas the ILMA caused increases similar to those seen with laryngoscopy and intubation. Circulatory disturbances can cause myocardial ischaemia and postoperative myocardial infarction.In our study mean HR was significantly higher at 1 min after insertion (highest being 80) and 1, 2, 3 min after removal of LMA (highest being 94). The mean SBP was significantly lower before insertion and 3 min after insertion of LMA. The mean SBP was significantly lower before insertion and 3 min after insertion of LMA. The mean DBP significantly lower before insertion of LMA. It was observed from our study 18 patients were extubated on operating table with stable hemodynamics, whereas 2 of them got reintubated in recovery, remaining 5 got extubated in recovery room. The mean time of extubation was 39.76±24.53 mins.

The rate of reintubation has varied from 0% in the study of Royse[12] up to 8% in the study of Montes et al[13]. This complication should not be viewed as a failure but as a possibility when a more liberal tracheal extubation criterion is used. Need for reintubation could be explained in part by the anaesthesia technique or most importantly, by the anaesthesiologist's learning curve. We believe that reintubation *per se* does not have a deleterious effect in the general status of the patient, and that it is not associated with an adverse outcome if expert personnel perform the procedure. In our study reintubation was 8%.

Many anaesthesiologists would object using a laryngeal mask in coronary artery bypass grafting although the stress response to tracheal intubation in patients undergoing coronary artery surgery is less with the laryngeal mask airway [14].

To date, no study has demonstrated a statistically higher incidence of myocardial infarction in patient's extubated in the operating room. In those studies the incidence of myocardial infarction and cardiac complications, including mortality was not different than the individual normally expected at centers.[12, 13]

Extubation after skin closure can be done in < 1hr, with stable hemodynamic with the use of short acting drugs and LMA to avoid complications associated with ET intubation.

- Advantages over ET intubation – Laryngoscopy avoided, less time taken to secure airway, stable hemodynamics, incidence of coughing is less, smooth transition to spontaneous breathing.
- Possible disadvantages – reintubation (8%), pain, awareness.

CONCLUSIONS -Early extubation using short/intermediate acting drugs and LMA is a safe method in uncomplicated cardiac surgical procedures to avoid post operative ventilation, to reduce the cost of the ICU stay and to promote early recovery.

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