IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 4 Ver. 6 (April. 2018), PP 76-80
www.iosrjournals.org

Comparative Study Ofthe Cricoid Pressure In Patients Undergoing Elective And Emergency Surgeries Using Manual Cricoid Pressure And Cricoid Pressure Manometer

Dr. Manali Nadkarni1, Dr. R.D.Patel2, Dr.Deepali Nagvenkar3
(1.Additional Professor, Department Of Anaesthesiology, Seth G. S. Medical College&K. E. M. Hospital, India)
(2.Professor, Department Of Anaesthesiology, Seth G. S. Medical College&K .E .M. Hospital, India)
(3. Expostgraduate Student,Department Of Anaesthesiology, Seth G. S. Medical College&K .E .M. Hospital, India
Correspondig Author:Dr.Manali Nadkarni

***Abstract**: Cricoid pressure is used for prevention of aspiration in inadequately starving patients as well as patients having gastrointestinal obstruction or delayed gastric emptying and are posted for elective or emergency surgery under general anaesthesia. This pressure may vary in the quality as well as force applied by different individuals. The aim of this study was to compare the cricoid pressure application using manual cricoid pressure and R.D.'s cricoid pressure manometer.The study was done in 100 adult patients undergoing elective and emergency surgery under general anaesthesia. They were divided into two groups of fifty patients. The two groups consisted of patients undergoing elective surgery and patients undergoing emergency surgery. These two groups were subdivided into further two groups of twenty five each. In both the main groups one subgroup received cricoid pressure manually and other subgroup received cricoid pressure with R.D.'s cricoid pressure manometer. Our results show that the R.D.'s cricoid pressure manometer had the benefit of uniform application of pressure and less interindividual variability. Manual cricoid pressure required training and cricoid force could not be predicted. Also the distortion of airway and oesophagus was more with manual cricoid pressure. Henceusing cricoid pressure manometer is better technique than manual cricoid pressure.*

Date of Submission: 28-03-2018 Date of acceptance: 14-03-2018

I. Introduction

Application of cricoid pressure1 has an invaluable prophylactic value in emergency surgical and obstetric cases that pose a risk of developing aspiration pneumonitis due to a backflow of gastric or oesophageal contents during induction of anaesthesia which may result in disastrous consequences.

This simple manoeuver employed during induction of anaesthesia enables manual control over the spill of gastric or oesophageal contents into the lungs until the cuffed endotracheal tube secures the airway. It also aids in preventing the inflation of stomach with air, which is a common cause of regurgitation resulting from positive pressure ventilation applied through a face mask.

This study endeavoured to decipher this apparently simple technique on a specialised scientific platform utilising pertinent knowledge databases coupled with a primary understanding of physiology and anatomy with a view to optimise the deliverable benefits in the safest possible manner by an inexperienced operator. Testimony to the unfortunate fact of cricoid pressure being operator dependent are reports stating occasional fatalities due to oesophageal rupture that resulted due to improper application in addition to several other articles reporting aspiration syndromes despite application of manual cricoid pressure.

Hence it necessitated a clear and urgent need for a set of standardised pressure variables applicable to the procedure of cricoid pressure application to be done by a universally accepted sensible device.

Cricoid pressure – Single handed cricoid pressure involves placing the thumb and middle finger on either side of the cricoid cartilage and the index finger above thereby preventing the actual movement of the cricoid cartilage. Cricoid pressure application from the left side of the patient avoids interference with laryngoscope insertion.

R.D.'s cricoid pressure manometer- This instrument devised by Dr. R.D.Patel et al consists of a manometer attached to a small cylinder with a piston and works on pneumatic principle. At the other end of the piston it is welded to a strip which is ¼ of a circle with smooth edges, which sits on the cricoid cartilage as it is of the same size and is covered with cotton and sticking plaster to have a cushioning effect. There are two openings on the outside of the cylinder: one opening on the upper side is attached to the manometer and the other opening for the movement of air during application. Manometer dial consists of markings from 0 to 2.1 on

the outer surface and 0-5-15 to 20 on inner surface calibrated in lb/inch sq or kg/cm2 each unit between 0-5 corresponds to 20N=2kg as calibrated on weighing scale.

Method of application of R.D.'s cricoid pressure manometer -

The piston was pulled out so that the manometer indicates 0 on the scale. The cricoid cartilage was marked with ink before application of cricoid pressure. The instrument was held with the thumb and index finger on either side (like pen holding) with the wrist resting on manubrium sterni. Intubating position with head and neck extension with head ring was given before application of cricoid pressure. Cricoid pressure manometer application was started simultaneously with induction of anaesthesia; at that stage it was slowly and steadily increased to 5 mark (20 N) after unconsciousness of the patient. Cricoid pressure was increased to 10 mark (30 N) after the muscle relaxant inj. succinyl choline was given. During the muscular fasciculations the pressure was decreased to 25 N and once fasciculationshad gone it was increased to 30 N.

II. Materials and method

After institutional ethics committee approval this study was conducted in 100 patients in Seth G. S. Medical college and K.E.M. hospital. The patients were divided into two groups of 50 patients each depending on whether they were posted for elective surgery or emergency surgery. These two groups were subdivided into two groups of 25 patients each. Group A and group B patients were posted for elective surgery while group C and group D patients were posted for emergency surgery. Patients in group A and group C received cricoid pressure manually and patients in group B and group D received cricoid pressure with R.D.'s cricoid pressure manometer.

Exclusion criteria for the patients were difficult airway anatomy, ASA status IV, Mallampati classification grade III & IV, neck collar, patients with cervical injury, thyroid swelling, laryngeal trauma or tumour, or any neck surgical pathology.

The study was conducted in 100 adult patients ASA physical status I – III undergoing elective or emergency surgery requiring general anaesthesia, neuromuscular blockade and endotracheal intubation.

Cricoid pressure manually

The patients breathed 100% oxygen prior to induction. Anaesthesia was induced with inj. Thiopentone sodium until loss of eyelash reflex. At the loss of consciousness cricoid pressure was given manually with the thumb and middle finger on either side of the cricoid cartilage and index finger on the cricoid cartilage. Inj. Succinylcholine was given 2 mg/kg IV. After onset of neuromuscular blockade laryngoscopy was done and patient was intubated with appropriate size endotracheal tube and the cuff was inflated. The cricoid pressure was then released.

Cricoid pressure with R.D.'s cricoid pressure manometer

Patients were induced with inj.Thiopentone sodium. After loss of consciousness the R.D.'s cricoid pressure manometer was placed on the cricoid cartilage and an initial measured pressure of 20 N was given. Inj. Succinyl choline was given. After the fasciculation of succinylcholine had passed the neck the pressure was increased to 30 N, laryngoscopy was done and the patient was intubated with appropriate size endotracheal tube and the cuff was inflated. The R.D.'s cricoid pressure manometer was then removed.

In both the methods during laryngoscopy it was seen whether the oesophageal opening was obliterated, Cormack Lehane grading was done and any distortion of the anatomy was noted. After release of the cricoid pressure it was seen whether the oesophageal opening could be seen and whether any regurgitant material was present.

Tracheal intubation difficulty

It was determined by using several parameters of intubation difficulty scores such as

- The number of supplementary intubation attempts. An attempt was defined as the entire process of inserting and removing the laryngoscope blade from the patient's mouth.
- The number of supplementary operators.
- The number of alternative intubation techniques used, release of cricoid pressure was considered as a change in technique.
- Glottic exposure as defined by Cormack and Lehane grading
- Necessity of applied external laryngeal pressure for improved glottis exposure (BURP- backward upward rightward pressure)
- Position of vocal cords at intubation
  0-vocal cords in abduction

1-if the cords were abducted or compressed blocking the passage of the endotracheal tube.

This system quantifies the progressive intubation difficulty. An intubation of no difficulty or ideal conditions is defined when the endotracheal tube is inserted into the fully visualised larynx with little effort on the first attempt. With increasing difficulty in intubation the head may be repositioned, there may be more than one

attempt at intubation, different laryngoscope blades and handles may be used, external laryngeal pressure may be applied, cricoid pressure may be released or the cricoid pressure manometer may be manipulated and more than one anaesthetist may be involved in intubation.

III. Observations and results

Statistical analysis of the results was done using Student t test and Z test.

Table no.1 MPC grade comparison between the four groups

MPC grading	Group A	Group B	Group C	Group D
	Elective manual	Elective instrument	Emergency manual	Emergency instrument
I	21	18	21	21
II	4	5	3	3
III	0	2	1	1

Table no. 2 Comparison of important parameters between the four groups

Parameter	Group A		Group B		Group C		Group D	
	Elective manual		Elective instrument		Emergency manual		Emergency instrument	
	No. of patients		No. of patients		No. of patients		No. of patients	
	Yes	No	Yes	No	Yes	No	Yes	No
Supplementary operators	0	25	0	25	4	21	1	24
Cricoid pressure released	0	25	0	25	3	22	1	24
Oesophageal opening distorted	5	20	25	0	4	21	25	0
Trauma	0	25	0	25	0	25	0	25
Regurgitation	0	25	0	25	0	25	1	24
External laryngeal pressure	0	25	0	25	1	25	0	25

Table no. 3 Comparison of local and systemic parameters between the four groups

		Group A		Group B		Group C		Group D	
		Elective manual		Elective instrument		Emergency manual		Emergency instrument	
		No. of patients		No. of patients		No. of patients		No. of patients	
		Yes	No	Yes	No	Yes	No	Yes	No
Local	Redness	1	24	2	23	0	25	4	21
	Swelling	0	25	0	25	0	25	0	25
	Bruising	1	24	0	25	0	25	0	25
Systemic	Vomiting	0	25	0	25	0	25	0	25
	Restlessness	0	25	0	25	0	25	0	25
	Retching	0	25	0	25	0	25	0	25
	Pain in throat	0	25	0	25	0	25	0	25
	Change in face mask ventilation	0	25	0	25	0	25	0	25

IV. Discussion

Cricoid pressure is applied as a part of rapid sequence induction of anaesthesia. It was first introduced into anaesthesia practice by Sellick in 19611. The technique he described involved pressure being applied to the front of the neck with the patient's head and neck extended. He demonstrated the efficiency of the technique in this position by showing obliteration of oesophageal lumen during cricoid pressure using radiographs and contrast medium.

In our study we have studied 100 patients in age group 20 – 60 years. We found that age group wise there was no significant difference.

The patients with MPC I, II, III. The P values were >0.05 in respect to MPC and were not significant. Different operative procedures were included.

Amount of cricoid pressure applied

Cricoid pressure was applied manually or with R.D.'s cricoid pressure manometer. The amount of cricoid pressure applied in case of manual cricoid pressure was minimum at the beginning of induction and maximum after giving muscle relaxant whereas in patients receiving cricoid pressure with R.D.'s cricoid pressure manometer a pressure of 20 N was applied simultaneously with induction and increased to 30 N after giving muscle relaxant.

Joseph Brimacombe and Alison Berry2in their review article of cricoid pressure mentioned that the cricoid pressure required to prevent regurgitation depends on the oesophageal pressure and the efficacy with which the force is transmitted to the oesophageal lumen. Vanner and Pryle3 calculated that a 30 N force applied to the cricoid cartilage should provide a pressure of >200 mm of Hg below the 10 cm2 area of the lamina of the average adult cartilage. In practice however, 30 N provides upper oesophageal sphincter pressure of only 40 mm of Hg.

In our study we observed that there was regurgitation of stomach contents in one patient in group D in whom cricoid pressure was applied with cricoid pressure manometer and oesophageal opening was occluded during direct laryngoscopy. Regurgitation occurred after intubation of the patient and inflation of the cuff of the endotracheal tube and after the release of cricoid pressure. Hence we conclude that cricoid pressure with R.D.'s cricoid pressure manometer had prevented the regurgitation into the lungs before endotracheal intubation and inflation of the cuff.

In group A and group C patients who received cricoid pressure manually the efficacy of cricoid pressure and the amount of cricoid force applied could not be estimated as it is not a measured force applied and varies from person to person. Hence there is advantage of R.D.'s cricoid pressure manometer as measured amount of cricoid pressure is delivered to the patient.

Number of attempts needed to intubate

Frederic Adnet et al4 in their article "The intubation difficulty scale" defined an attempt as one advancement of the endotracheal tube in the direction of the glottis during direct laryngoscopy or one like advancement of the tube in the case of a blind intubation trial.

R. M. Harry and J. P. Nolan5 in the study of use of cricoid pressure and intubating laryngeal mask airway found that out of 21 patients in the group of non cricoid pressure 16 patients required 1 attempt, 3 patients required 2 attempts and 2 patients required 2 attempts. In group of 13 patients in whom cricoid pressure was given, 10 patients required 1 attempt, 2 patients required 2 attempts and 1 patient required 3 attempts at intubation.

In our study of 100 patients in group A 24 patients required 1st attempt, 1 patient required 2nd attempt. In group B 22 patients required 1st attempt, 2 patients required 2nd attempt and 1 patient required 3rd attempt. In group C 20 patients required 1st attempt and 5 patients required 2nd attempt. In group D 24 patients required 1st attempt and 1 patient required 2nd attempt.

In our study one patient in group B where cricoid pressure was applied with R.D.'s cricoid pressure manometer more than 2 attempts were needed to intubate the patient the patient but there were no supplementary operators. So we noticed that in patients receiving cricoid pressure by R.D.' cricoid pressure manometer laryngoscopy although slightly hampered but was not difficult. But no incidence of failed intubation was found due to cricoid pressure manometer or cricoid pressure given manually.

Supplementary operators

In the article Intubation difficulty score by Frederic Adnet et4al the number of supplementary operators represents the number of additional persons directly attempting (i.e. not assisting) intubation.In our study in group A and group B no supplementary operators were required. In group C supplementary operators were required in 4 patients and in group D in 1 patient.

Comparison of associated parameters

Release of cricoid pressure

In our study cricoid pressure had to be released in 3 patients of group C and 1 patient of group D.

Necessity of applied external laryngeal pressure for improved glottis exposure(BURP)

Only 1 patient in group C required BURP.

Trauma

3 patients in group B and 1 patient in group C had trauma to the lips due to laryngoscope blade during intubation. This shows slight practice is required for intubation when cricoid pressure is applied by cricoid pressure manometer.

Obliteration of oesophageal opening

In group A 5 patients and in group C 4 patients had oesophageal obliteration and in group B and D all the patients had oesophageal obliteration. These patients had received cricoid pressure with R.D.'s cricoid pressure manometer. In these patients the obliteration of oesophageal opening was seen after application of

cricoid pressure, after intubation and inflation of the cuff and only after the cricoid pressure was released the oesophageal opening could be seen properly. Hence it can be concluded that due to improperly applied or inadequately applied manual cricoid pressure the complete obliteration of oesophageal opening cannot be seen. Also the cricoid pressure given varies with the operator whereas with R.D.'s cricoid pressure manometer a measured amount of cricoid pressure was applied which was adequate to distort the oesophageal opening.

Cormack and Lehane Grading of glottis exposure6

With respect to Cormack Lehane grading, cricoid pressure either given manually or with R.D.'s cricoid pressure manometer does not make intubation difficult.

V. Complications

Local complications

Redness- In group B 2 patients had redness at site of application and in group D 4 patients had redness. These patients had received cricoid pressure by cricoid pressure manometer.

Bruising- Only 1 patient had bruising(nail mark) in manual cricoid pressure group.

Swelling - There was no swelling seen in any of the groups.

This shows that the pressure exerted by cricoid pressure manometer may give rise to slight redness at the sight of application but there was no bruising or swelling. On the other hand in manual cricoid pressure group one patient each had redness and bruising at the site of application.

Systemic complications

Such as vomiting, restlessness, retching, pain in throat and gastric inflation was not seen in any patient in all the groups.

Impact on airway management

In our study of 100 patients in whom we gave cricoid pressure manually and cricoid pressure with R.D.'s cricoid pressure manometer, we found the introduction of laryngoscope had no difficulty in all the groups.

In our study we ventilated the patients with face mask ventilation by giving oxygen flush during inspiration and lifting the mask from one side for expiration. No use of reservoir bag was made. There was no resistance or obstruction or regurgitation.

In the patients cricoid pressure given by R.D.'scricoid pressure manometer the larynx was centralised and no distortion was seen whereas in patients in whom the cricoid pressure was applied manually there was slight distortion of the larynx to the right side with at times adduction of the vocal cords due to inappropriate and inexperiencedapplication of cricoid pressure.Hartsilver and Vanner7 had observed in their study that the mechanism of laryngeal obstruction with cricoid pressure may be either due to deformation of the cricoid cartilage or tilting of the cricoid cartilage resulting in closure of the vocal cords.

Pressor response

In our study we found that in patients of all the groups there was pressor response seen. There was a change in pulse rate of +/- 30 beats/min and a change in blood pressure of +/-20 mm of Hg at laryngoscopy and intubation.

V. Conclusion

Cricoid pressure manually and cricoid pressure with R.D.'s cricoid pressure manometer is effective in patients undergoing elective as well as emergency surgeries.

Impact on airway is seen more with manual cricoid pressure. Complications were more with manual cricoid pressure than withR.D.'s cricoid pressure manometer. Manual cricoid pressure required training and cricoid force could not be predicted well as with R.D.'s cricoid pressure manometer a measured amount of cricoid pressure could be given. Thereby cricoid pressure withR.D.'s cricoid pressure manometer is superior to the manual cricoid pressure.

References

[1] Sellick B.A. Cricoid pressure to control regurgitation of stomach contents during induction of anaesthesia. The Lancet,1961,2:404-406.
[2] Joseph Brimacombe, Alison Berry.Review article cricoid pressure. Canadian journal of anaesthesia,1997, 44,4:414-425.
[3] Vanner R.G., O.Dwyer J.P., Pryle B.J., Reynolds F. Upper oesophageal sphincter pressure and the effect of cricoid pressure. Anaesthesia, 1992,47:95-100.
[4] Frederic Adnet et al. The intubation difficulty scale – proposal and evaluation of a new score characterising the complexity of endotracheal intubation. Anaesthesiology, 1997, 87,6:1290-1297.
[5] R.M.Harry, J.P.Nolan:.The use of cricoid pressure with intubating laryngeal mask. Anaesthesia,1997, 54:656-659.
[6] Cormack R.S., Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia, 1984,34: 1105-1111.
[7] E.L.Hartsilver, R.G.Vanner .Airway obstruction with cricoid pressure. Anaesthesia,2000, 55: 208-211.

Dr. Manali Nadkarni1" Comparative Study Of The Cricoid Pressure In Patients Undergoing Elective And Emergency Surgeries Using Manual Cricoid Pressure And Cricoid Pressure Manometer."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 4, 2018, pp 76-80.