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A Survey on Cricoid Pressure Application by Anesthetists.

Nikandish R*, Shahbazi Sh**, Zand F **, Jamshidi H§.

* Assistant Professor, Department of Anesthesiology, Fasa University of Medical Sciences, Fasa, Iran, ** Assistant Professor, Department of Anesthesiology, Shiraz University of Medical Sciences, Shiraz, Iran, § Anesthesiology Assistant, Dr. Shariati Hospital, Fasa, Iran.

Correspondence: Dr. Reza Nikandish, Department of Anesthesiology, Fasa University of Medical Sciences, Fasa, Iran, Tel.: +98(731) 222-1370, Fax: 98(731) 222-0991, E-mail: nikandishr@sums.ac.ir

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Abstract:

Background: For 40 years cricoid pressure has been used to prevent regurgitation of gastric contents during induction of anaesthesia. Available studies have highlighted poor techniques regarding cricoid pressure. Patient safety could be challenged by incorrect use of cricoid pressure The aim of this study was to assess the practice and knowledge of cricoid pressure among anesthesiologist attending in the ninth international congress of anesthesia and resuscitation in Iran.

Materials and methods: This cross sectional observational study included 59 anesthesiologists attending the 9th international Iranian congress of anesthesia and resuscitation in 2006. Each subject was asked to apply cricoid pressure on an undressed laryngeal model for one minute. The model was an anatomically correct representation of the human larynx. It was mounted onto the base plate of a kitchen scale . Participants were blinded to the results. Five measurements were obtained from each candidate(0,15,30,45 and 60th second).Participants was also asked to complete a questionnaire containing demographic data and some questions regarding attitude and knowledge of participants regarding Slick's maneuver.

Results: Eighteen participants(30%) applied the target cricoid force (3-4 kg).When considering both correct anatomical position and right range of applied force only 11 participants(19%) were successful. Mean applied force significantly decreased at the end of one minute and mean applied force by women was significantly less than men. There was no statistically significant diffenece between academic staff and other anesthesiologists in application of target force. Only eight participants(13.6%) were aware of the target cricoid force.

Conclusion: Application of cricoid pressure by the participant anesthesiologists is poor.Use of simple models for training during refresher courses for practicing anesthesiologist in addition to stressing on the theoretical base may improve the quality of performance of the Sellick`s maneuver.

Key Words: Cricoid pressure, Training , Anesthesiologist.

Introduction:

Pressing on 'the lower part of the larynx' to occlude the esophagus was first described by Monro in 1774 for near-drowned victims. This maneuver was revisited by Sellick in 1961 as a useful technique for preventing pulmonary aspiration during induction of anesthesia in emergency cases [1]. As originally described by Sellick, before induction of anesthesia, the cricoid is palpated and lightly held between the thumb and the second finger. As anesthesia begins, pressure is exerted on the cricoid cartilage mainly by the index finger. Immediately before intravenous induction of anesthesia, while the patient is still awake, cricoid pressure is applied lightly (20N or 2 kg) by a trained assistant. Once the patient has lost consciousness, the force on the cricoid cartilage is increased to 40N(4 kg). Cricoid pressure is released after tracheal intubation is confirmed.

Despite the fact that cricoid pressure has become widely accepted as the standard of practice during anesthesia in the UK and USA and many parts of the world, none of the papers confirm the perceived clinical benefit of cricoid pressure in reducing the incidence of aspiration during an emergency rapid sequence induction(RSI)[2].Incorrect application of cricoid pressure is not without risk. Less than 20 N of force cannot prevent from aspiration and due the its effect on decreasing lower esophageal sphincter tone it may predispose the patient to regurgitation[3]. More than 40N of force applied to the cricoid cartilage after loss of consciousness can obstruct the airway [4, 5] and possibly cause difficulty with tracheal intubation [6]. Available studies have highlighted poor techniques and bad knowledge regarding cricoid pressure [7–9]. The aim of this study was to assess the practice and knowledge of cricoid pressure among the anesthesiologists attended the 9th international Iranian congress of anesthesia and resuscitation in 2006.To best of our knowledge, this is the first survey regarding Selik's maneuver in our region.

Materials and Methods:

This cross sectional, observational study included the anesthesiologists attending the 9th international Iranian congress of anesthesia and resuscitation in 2006 in Mashhad. The Research Ethics Committee of Fasa faculty of medicine approved this study. After oral informed consent, volunteers were asked about their routine practice, training and knowledge relating to cricoid pressure in a structured interview. After completion of the questionnaire each subject was asked to apply cricoid pressure continuously to simulate application of the Sellick's maneuver to "unconscious" patient on a laryngeal model for one minute. An undressed laryngeal model was used in this study (Figure 1). It was mounted onto the base plate of a kitchen scale (LAICA Italy) with a range of 0.000–10.000 kg and a resolution of 100gr. Use of a weighing scale to practice quantifying applied force has been previously suggested [10].

The scale was placed on a table such that the cricoid cartilage was at a height of 1 meter from the ground, similar to a

supine patient on a standard operating room bed. All Participants approached the laryngeal model from the left side and applied cricoid pressure with their left hand. The applied force at 0,15,30,45 and 60 seconds was recorded by a single observer. The target range for cricoid force was 3–4kg. Each practitioner was blinded to the extent to which they compressed the simulator. In addition, the anatomical site of applied force by the participants was recorded. The mean value of all five measurements was calculated for each participant. The mean scores were then grouped into those being below, within, and above the target range. Results were analyzed using and SPSS version 13, applying k2 and t-tests, where appropriate. A P-value of 0.05 or less was considered as statistically significant.

Figure 1: LAICA kitchen scale and undressed laryngeal model used in the study.

Results:

Fifty nine anesthetist participated in the study. The mean age was 40 years and mean years of experience was 8.8.Forty five participants were male(76.3%) and 25 of them were attending faculty members(42.4%). Cricoid pressure was used routinely in 82% of patients who participants considered to need it. Seventy-five percent of the participant anesthetists considered the cricoid pressure as a standard of care in anesthesia management of emergency cases.

The Mean applied force by eighteen participants (30.5%)was at the target cricoid force(3-4 kg) and in 41 (69.5%) were outside the target range of these, 17 participants (28.8%) applied a cricoid force below 3kg and 24 contributors (40.7%) applied a cricoid force greater than 4kg (Table 1).

Table 1: Mean applied cricoid force in one minute

Mean cricoid force applied in one minute	Number	Percent
In the target range(3-4 kg)	18	30.5
Less than target range(<3kg)	17	28.8
More than target range(>4kg)	24	40.7

The applied force in nine participants(15.3%) was in the target range at all five measurement .Thirteen participants(20.3%) applied less than 3 kg and 17 participants(28.8%) applied more than 4 kg at all measurement (Table 2). A force at the target range was recorded at least once in 50 of subjects. The mean applied force by female participants(3.17±1.13) was significantly less than that applied by male anesthetists(4.3±1.73)(P=0.027).The mean applied force by attending faculty members (4.05±1.34) was not significantly different from the force applied by nonacademic anesthetists (4.05±1.92)(P=0.943) (Table 3). There was no correlation between force applied and number of years in clinical anesthesia work.

.Table 2: Range of mean applied cricoid force in one minute

Range of mean applied cricoid force in one minute	Number	Percent
Always in the target range(3-4 kg)	9	15.3
Always less than target range(<3kg)	13	22
Always more than target rang(>4kg)	17	28

Table 3: Mean cricoid force applied by males and females and faculty and non-faculty anesthetists

Mean applied cricoid force	Number	Mean	P-value
Females	45	4.3±1.73	0.027
Males	14	3.17±1.13	
Faculty members	26	4.01±34	0.943
Non faculty member anesthetists	33	4.05±1.92	

Eight subjects (13.6%) quoted the force to be used in cricoid pressure at the range of 3-4 kg. Forty-two participants(71.3%) quoted the force out of 3-4kg and nine anesthetist(15.3%) had never heard of any recommended level of force to be used for the application of cricoid pressure.

Almost one half of the subjects (49%) applied pressure over the thyroid cartilage, in this model .Considering both the location and the amount of applied force, only 11 subjects(19%)applied the target force at the correct site. The mean self assessment of the participant anesthetists about their ability for application of cricoid pressure was 74 from 100.

The applied force at the 60 seconds after starting the cricoid pressure(3.73±1.4) was significantly less than the force applied at the beginning of the maneuver(4.67±2.11)(P<0.0001).

Discussion:

To the best of our knowledge, this is the first study addressing the use of cricoid pressure in Middle East. Only 20% of participants applied cricoid force within the target range and in a correct anatomical site. This level of performance is similar to that reported previously in studies of perioperative/anesthetic personnel [9,10,11,12].

The largest reported survey to date concerning standards of practice for applying cricoid pressure has been done by Meek et al.[7]. They found that more than two thirds of participant anesthetic and operating nurses applied a force out of 3-4 kg. In the study of Schmidt et al force exceeding 60 N, i.e. maximal scaling capacity, was recorded at least once in 21% of anesthesiologists[13]. Clark et al. in an assessment of cricoid pressure application by 38 doctors and 69 nurses working in the emergency department found that twenty-seven participants (25%) applied the target cricoid force and 80 (75%) were outside the target range [14]. The pertaining force applied by all of anesthesiology faculty in the study of Vanner et al. was lower than target force [4]. The suboptimal results in the attending faculty group for cricoid pressure in the present survey as in the study of Vanner et al is illustrative of the pervasive need for an easy and reliable method of teaching the recommended amount of cricoid pressure to all anesthesia practitioners.

High and low cricoid forces are clinically important. If applied with too much force, cricoid pressure can prevent mask ventilation, impair the view at laryngoscopy and prevent the insertion of airway devices [4,5]. Force equivalent to a weight of 4.5 kg has been shown to increase the incidence of airway obstruction when compared to 3 kg [6]. Similarly, the application of too little force may allow regurgitation of gastric contents into the oropharynx and pulmonary aspiration.

To be effective in occluding esophagus and in preventing regurgitation, the target force should be applied directly over the cicoid cartilage. Despite the fact that the laryngeal model used in our study was undressed and both cricoid and thyroid cartilages were clearly visible, only 48% of anesthesiologists applied the force on the correct anatomical site. In the study of Schmidt et al. 20% of anesthesiologists applied pressure over thyroid cartilage[13]. Considering both target force and anatomical site, the results of the present study shows very poor application of cricoid pressure by the participating anesthesiologists.

The accepted practice is that cricoid pressure should be maintained in patients at risk until the airway is protected with a cuffed endotracheal tube. However the present study shows a significant decease in applied force within one minute. Ashurst et al. found a substantial decrease in the force applied to the cricoid cartilage during a single application, even after training in forty-nine anesthetic assistants and anesthetists [9]. Other studies also have shown that sustaining the appropriate force for the duration of rapid sequence induction (RSI) has been is difficult [15]. This is more important when intubation is prolonged due to difficult airway in an emergency setting where ineffective cricoid pressure may predispose the patient to the risk of aspiration.

This study shows that mean applied force by female anesthetists is less than males and this is in contrast to other findings showing that gender per se does not seem to considerably influence the extent of force used to apply cricoid pressure [9,16].

Most of the participant anesthetists in the present survey used cricoid pressure in their routine anesthesia practice in emergency cases. They also gave themselves a relatively high self-assessment score to their ability for implementing this maneuver. Regarding the poor performance of cricoid pressure by the participants and potential problems related to improper application of this maneuver special attention should be paid to increasing the quality of performance through practical training on a model before practicing on patients. Since the attending anesthesiologist is most likely to be the one holding cricoid pressure while young, eager (and less experienced) residents and medical students learn to intubate patients, the results here suggest that they are an important target group. This is particularly important in light of the evidence of the loss of upper esophageal barrier pressure before loss of consciousness after intravenous induction of anesthesia [3].

Simple instruction and use of training models should be more widespread in training as an aid to the acquisition and maintenance of this vital skill. Several studies have confirmed that a range of staff and students can be trained to apply cricoid pressure correctly, but there are conflicting results regarding retention of skills [7,9,11]. A model integrating the concept of force, simply done with a kitchen scale, and made readily available for staff to train on prior to RSI, could improve application of cricoid force at target range. This might represent another crucial event during the 'preparation' phase of RSI. It is interesting that in the present study non of the subjects had been formally educated on how to apply cricoid pressure during their training stage.

There are some limitations in this study. It might be presumed that anesthetists attending a national conference would be the most interested, most knowledgeable and best trained. Therefore the results of this study regarding the quality of application of cricoid pressure cannot be generalized at the national level.

The laryngeal model used in this study was undressed and cricoid and thyroid cartilages were visible so the results of this study should be generalized to clinical setting cautiously. On the other hand the plastic laryngotracheal model used in this study may not have the compressibility and elasticity of the actual human laryngeal cartilage and neck.

We have done an opportunistic study in a national conference without any sampling design and including only the volunteers This limitation should be considered in interpretation of the results.

Conclusion:

Application of cricoid pressure by the participant anesthesiologists is poor. Use of simple models for training in refresher courses for practicing anesthesiologist in addition to stressing on the theoretical base may improve the quality of performance of the Sellick`s maneuver.

References:

1. Landsman I . Cricoid pressure: indications and complications. Pediatric Anesthesia, 2004 14: 43–47

2. Butler J. Cricoid pressure in emergency rapid sequence induction. Emerg Med J, 2005;22:813–816.

3. A. Garrard, A. E. Campbell, A. Turley , J. E. Hall. The effect of mechanically-induced cricoid force on lower oesophageal sphincter pressure in anaesthetised patients. Anaesthesia, 2004, 59, pages 435–439.

4. Vanner RG. Tolerance of cricoid pressure by conscious volunteers.International Journal of Obstetric Anesthesia 1992; 1: 195–8.

5. Allman KG. The effect of cricoid pressure application on airway patency. Journal of Clinical Anesthesia 1995; 7: 197–199.

6. Morgan M. The confidential enquiry into maternal deaths. Anaesthesia 1986; 41: 689–91.

7. Meek T, Gittins N, Duggan JE. Cricoid pressure: knowledge and performance amongst anaesthetic assistants. Anaesthesia 1999: 54: 59–62.

8. Howells TH, Chamney AR, Wraight WJ, Simons RS. The application of cricoid pressure. An assessment and a survey of its practice. Anaesthesia 1983: 38: 457–460.

9. Ashurst N, Rout CC, Rocke DA, Gouws E. Use of a mechanical simulator for training in applying cricoid pressure. Br J Anaesth 1996: 77: 468–472.

10. T. J. Clayton , R. G. Vanner. A novel method of measuring cricoid force. Anaesthesia, 2002, 57, pages 326-329.

11. Herman NL, Carter B, Van Decar TK. Cricoid pressure: teaching the recommended level. Anesth. Analg. 1996; 83: 859–63.

12. Owen H, Follows V, Reynolds K, Burgess G, Plummer J. Learning to apply effective cricoid pressure using a part task trainer. Anaesthesia 2002; 57: 1098–101.

13. Schmid A, Åkeson J. Practice and knowledge of cricoid pressure in southern Sweden. Acta Anaesthesiol Scand 2001; 45: 1210–1214

14. Clark R K, Trethewy C E. Assessment of cricoid pressure application by emergency department staff. Emergency Medicine Australasia 2005 17 , 376–381.

15. Meek T, Vincent A, Duggan JE.Cricoid pressure: can protective force be sustained? British Journal of Anaesthesia 1998; 80: 672–4.

16. Wraight WJ, Chamney AR, Howells TH. The determination of an effective cricoid pressure. Anaesthesia 1983: 38: 461–466.