

**CLINICAL PRACTICE**

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**The effective application of cricoid pressure**

**Cindy Hein** BHSc, DipAppSc

Lecturer, Flinders University, Bedford Park, South Australia & Intensive Care Paramedic,  
SA Ambulance Service.

**Prof. Harry Owen** MD FRCA FANZCA

Director, Clinical Skills and Simulation Unit, Department of Medical Education and  
Department of Anaesthesia & Pain Medicine, Flinders University, Adelaide, Australia.

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**INTRODUCTION**

Cricoid pressure is a vital skill that should be performed during resuscitation with bag and mask and emergency tracheal intubation. Both the Australian Resuscitation Council and the American Heart Association include the application of cricoid pressure in their guidelines on resuscitation. This review briefly outlines the history of cricoid pressure, when and why it should be performed, and how it can be taught effectively.

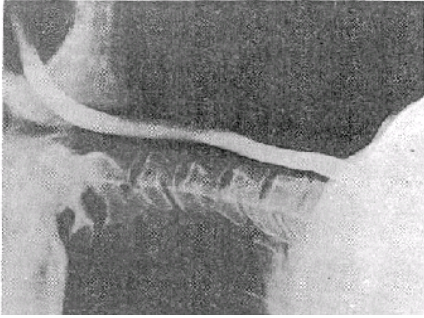
**HISTORICAL ASPECTS OF CRICOID PRESSURE**

In 1774 Dr Munro reported that by applying a downward pressure on the neck air was directed to the lungs and this prevented gastric distension.<sup>1</sup> This technique did not gain wide acceptance, but 187 years later (1961) Brian Sellick published investigations on the value of cricoid pressure to prevent regurgitation during induction of anaesthesia.<sup>2</sup>

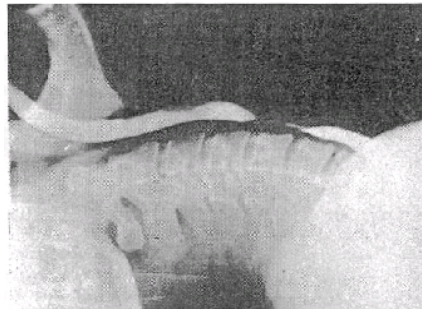
When Sellick died in 1996, his obituary inferred that cricoid pressure '...has probably saved more lives and reduced pulmonary morbidity world wide than any other advance in anaesthetic management'.<sup>3</sup>

**WHAT IS CRICOID PRESSURE?**

Cricoid pressure, sometimes called Sellick's manoeuvre (or even 'The Sellicks'), is the application of backward pressure on the cricoid cartilage to occlude the oesophagus. This manoeuvre prevents aspiration of gastric contents during induction of anaesthesia and in resuscitation of emergency victims when intubation is delayed or not possible. Sellick demonstrated this in an x-ray view by placing a soft latex tube distended with a contrast medium within the lumen of the pharynx and oesophagus of an anaesthetised and paralysed patient<sup>2</sup> (Figure 1A). He then extended the neck of the patient and applied cricoid pressure at the level of the 5th cervical vertebrae, obstructing the lumen of the oesophagus<sup>2</sup> (Figure 1B).



**FIGURE 1 A** Lateral x-ray of neck showing upper oesophagus filled by latex tube containing contrast medium.  
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**FIGURE 1 B** Same as 1, showing obliteration of lumen by cricoid pressure at level of 5<sup>th</sup> cervical vertebrae.  
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### **WHEN SHOULD CRICOID PRESSURE BE PERFORMED?**

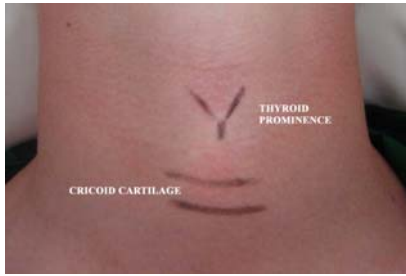
Cricoid pressure should be performed during resuscitation when endotracheal intubation is delayed or not possible, particularly when patients are manually ventilated via bag and mask. Cricoid pressure should be performed during induction of anaesthesia for both emergency surgery (full stomach) and for elective surgery when lower oesophageal sphincter is likely to be incompetent, (e.g. last half of pregnancy or gastro oesophageal reflux disease possible), and in patients with delayed gastric emptying (e.g. diabetic autonomic neuropathy).

### **WHO SHOULD BE ABLE TO PERFORM CRICOID PRESSURE?**

Any persons who are likely to be involved in resuscitation of emergency victims and those involved in anaesthesia. Such staff include; anaesthetists, anaesthetic nurses/technicians, recovery nursing staff, intensivists, critical care physicians and nurses, emergency department physicians and nurses, radiologists, radiographers, endoscopists, nurse practitioners, midwives, paramedics and first aid responders.

### **HOW TO PERFORM CRICOID PRESSURE**

Locate the most prominent protuberance on the front of the neck in the midline (the thyroid prominence) (Figure 2). Find this point then run your finger towards the patient's feet (staying in the midline) until you feel your finger drop into the cricothyroid notch or membrane. The next horizontal bar is the cricoid cartilage. Place the thumb and index finger on either side of the cricoid cartilage (Figure 3) and press directly backwards at a force of 20-30 newtons against the cervical vertebrae. Maintain pressure until directed to release.



**FIGURE 2**

The cricoid cartilage can be located inferior to the thyroid prominence and cricothyroid membrane. In this image the upper edge of the thyroid cartilage and its anterior border have been marked.



**FIGURE 3**

The cricoid cartilage should be fixed between digits and then pressed backwards at a force of 20-30 newtons.

If cricoid pressure is to be protective it must generate an occlusive pressure in excess of oesophageal or gastric pressure. The correct amount of 'pressure' (it is actually a force that is being applied)<sup>4</sup> is 20-30 Newtons, which is about 2-3 kilograms (10 N = ~ 1 Kg). The application of cricoid pressure requires a dedicated rescuer as it must be maintained until the airway is secured by endotracheal intubation. This may be difficult where there are limited rescuers or when prolonged application is required.

#### **POSSIBLE CONTRA-INDICATIONS TO CRICOID PRESSURE**

- Trauma to anterior neck
  - landmarks may be difficult to define
- Unstable C Spine injury
  - risks neck movement but can be performed if a bi-manual technique has been practiced
- Patient actively vomiting
  - risk of oesophageal rupture
- Limited number of rescuers
  - The International Liaison Committee on Resuscitation (ILCOR) guidelines state that cricoid pressure is applied as soon as an extra (third) rescuer arrives (5). If only one or two rescuers are present, airway and breathing are higher priorities!
- When intubation is made difficult
  - may restrict laryngoscopic view, especially likely if applied incorrectly

#### **INCORRECT APPLICATION OF CRICOID PRESSURE**

Although recognised as an important skill, recent studies found that many of those who regularly perform cricoid pressure (anaesthetic assistants/nurses etc), do not know the correct techniques, duration, or amount of force to apply.<sup>6-10</sup> Whilst too little force is ineffective,<sup>11,12</sup> overzealous efforts can restrict ventilation and may worsen laryngoscopic view.<sup>13-15</sup> Additionally, as little as 4 minutes of application of cricoid pressure at 30 newtons can lead to arm fatigue and subsequent incorrect technique,<sup>16</sup> but practice and arm positioning is helpful.

Cricoid pressure should not be confused with optimal external laryngeal manipulation (OELM) or backward upward right pressure (BURP) on the thyroid cartilage which is used to improve visualisation of the vocal cords when intubating.<sup>17</sup> BURP is performed by an assistant and moves the larynx to the right whilst the tongue is displaced to left by the laryngoscope blade. These are techniques employed to improve visualisation of the cords and do not protect the lungs from regurgitation.

### **LEARNING/TEACHING CRICOID PRESSURE**

The recommended amount of force for effective and safe cricoid pressure is 30N, but how do we learn what 30N is? The following is a list of techniques that have been suggested in applying/learning cricoid pressure:

- Surrogates:
  - Nose pain;** applying pressure on one's own nose until pain is felt has been suggested<sup>18</sup> however recent research has shown this is not at all useful and this advice should be discontinued.<sup>6</sup>
  - Neck pain;** pressure on one's own cricoid that prevents swallowing.<sup>19</sup> This has never been correct since more than 20N of force can provoke retching in awake subjects.<sup>20</sup>
- Aides
  - Cricoid yoke;** a padded yoke conforming to the external radius of a cricoid cartilage attached to a hand-held strain gauge to assist in applying a measured consistent pressure over the cricoid cartilage.<sup>21</sup> This device has caused deformation of the cricoid cartilage<sup>22</sup> and it is no longer recommended.
- Trainers
  - Infant scales;** applying force to a laryngotracheal airway model which is placed on a set of infant scales<sup>23</sup>
  - Floor scales;** standing on floor scales<sup>24</sup> and noting own weight and applying force to a model using the reduction of weight by 3 kilograms to reproduce required force
  - Syringe;** depressing the plunger on a syringe and "feeling" amount of force required<sup>4,25</sup>
  - Cricoid pressure trainer;** encompasses realistic patient anatomy with real-time feedback on technique. The user is able to view the direction, duration and amount of force applied to the neck of the manikin, on a graphical display panel.<sup>7</sup>

Regardless of adjunct used, retention of learning requires constructive education using measured techniques with continual practice and monitoring of skill level. Moreover, qualitative and quantitative descriptors have not been found to be useful<sup>6,10</sup> whereas a part-task trainer such as the "cricoid pressure trainer" (described above) encompasses all aspects of training (e.g. finger position and direction of force) not just applied force.

### **CRICOID PRESSURE AND THE LARYNGEAL MASK AIRWAY**

Cricoid pressure has been shown to prevent gastric insufflation when used with the laryngeal mask airway (LMA).<sup>26</sup> Although the LMA can be successfully inserted whilst cricoid pressure is being applied,<sup>27,28</sup> some have stated it makes insertion difficult,<sup>29</sup> and others found

ventilation may be impeded.<sup>26,30</sup> If insertion of the LMA fails, cricoid pressure may be momentarily released and re-applied after successful insertion.

### **CRICOID PRESSURE AND PAEDIATRICS**

The application of cricoid pressure in the paediatric population has been shown to prevent insufflation of gas into the stomach during face mask ventilation.<sup>31</sup>

### **CONCLUSION**

Cricoid pressure is an important skill used during bag and mask resuscitation, during induction of anaesthesia prior to intubation and in resuscitation when intubation is delayed or not possible. When used correctly, cricoid pressure protects against aspiration of the lungs and insufflation of the stomach however incorrectly applied, its use may impede ventilation or make laryngoscopy and subsequent intubation difficult. If a “cannot intubate” or “cannot ventilate” scenario presents, clinicians should reassess the manner in which cricoid pressure is applied and be prepared to adjust or remove it momentarily until ventilation is re-established, or intubation is secured. Ideally all health professionals who might be faced with resuscitation or intubation should learn how to apply cricoid pressure both safely and effectively.

Cricoid pressure is a technical skill that requires constructive education using measured techniques with continual practice and monitoring of skill level.

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#### **Financial Disclosure**

Professor Harry Own is a Director of Flinders Meditech. This university-owned subsidiary produces a range of medical simulators, including a cricoid pressure trainer.

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