RAPIDITY AND ACCURACY OF TRACHEAL INTUBATION IN A MANNEQUIN: COMPARISON OF THE FIBREOPTIC WITH THE BULLARD LARYNGOSCOPE

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SUMMARY

Successful tracheal intubation with the flexible fibreoptic bronchoscope requires a certain amount of skill which is acquired by practice. It has been suggested that the new Bullard laryngoscope may be mastered more easily. To determine if learning was superior with a flexible fibreoptic or the Bullard device, the ease of tracheal intubation with both devices was compared by first-year anaesthetic residents, using a mannequin modified to make intubation difficult. The Bullard laryngoscope was as easy to master as the flexible fibreoptic device, but passage of the tracheal tube took longer. Both devices require a similar amount of practice.

KEY WORDS


Recognition and subsequent management of the difficult airway are complex problems for both trainee and teacher [1-3]. Studies have demonstrated advantages of flexible fibreoptic bronchoscopes over conventional laryngoscopes [4-6]. However, they require a significant time to prepare, may not be readily available, and require a significant amount of teaching and continued practice [1, 7].

The Bullard laryngoscope has been designed to circumvent some of these difficulties. It is a combination of an anatomically shaped rigid blade with a fibreoptic light source to aid direct visualization of the larynx and subsequent tracheal intubation. The adult version (fig. 1) may be prepared as rapidly as a conventional laryngoscope.

A recent study suggested that the device might be easier to master than the flexible fibreoptic laryngoscope, permit rapid visualization of the vocal cords and oral tracheal intubation, and offer the potential for a low risk of failed intubation [8].

The purpose of this study was to ascertain if the Bullard laryngoscope is easier for residents to master than "conventional" fibreoptic intubation.

METHODS

Twenty residents of less than 1 year of anaesthetic experience were invited to pass a tracheal tube into a mannequin which had been adjusted so that tracheal intubation was as difficult as possible. Only the epiglottis was just visible (to a senior anaesthetist) using a Macintosh blade. This corresponds to grade III of Cormack and Lehane's classification as modified by Samsoon and Young [9, 10]. Residents were asked to attempt tracheal intubation using three methods:

1. Fibreoptic oral tracheal intubation, without any assisting devices except jaw lift provided, if requested, by a helper.
2. Bullard laryngoscope using an oral tracheal tube introduced over a stylet.
3. Bullard laryngoscope using the forceps port to introduce a flexible metallic wire into the trachea, followed by removal of the blade and passage of the oral tracheal tube over the wire through the larynx.

A standardized description and demonstration of each method was given to each resident, followed by one practice attempt.

Each resident performed each technique 10...
COMPARISON OF LARYNGOSCOPES

Removable spanner wrench
Dual thumb lever
Guide posts
Forceps seal

Fig. 1. The Bullard laryngoscope.

TABLE I. Mean (SD) time for tracheal intubation and degree of difficulty. *P < 0.05 compared with first five attempts; †P < 0.05 compared with fibreoptic; ***P < 0.001 compared with other techniques

<table>
<thead>
<tr>
<th></th>
<th>Fibreoptic</th>
<th>Bullard + stylet</th>
<th>Bullard + wire</th>
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</thead>
<tbody>
<tr>
<td>All 10 intubations</td>
<td>15.0 (3.9)***</td>
<td>22.4 (7.2)</td>
<td>28.5 (5.8)</td>
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<td>(n = 200)</td>
<td>(n = 200)</td>
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</tr>
<tr>
<td>First five</td>
<td>19.0 (4.3)</td>
<td>27.3 (6.4)</td>
<td>31.7 (6.9)</td>
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<tr>
<td>intubations</td>
<td>(n = 100)</td>
<td>(n = 100)</td>
<td>(n = 100)</td>
</tr>
<tr>
<td>Second five</td>
<td>12.1 (4.3)*</td>
<td>19.1 (6.3)*</td>
<td>25.0 (5.6)*</td>
</tr>
<tr>
<td>intubations</td>
<td>(n = 100)</td>
<td>(n = 100)</td>
<td>(n = 100)</td>
</tr>
<tr>
<td>Degree of difficulty (1-10)</td>
<td>2.1 (0.9)</td>
<td>2.9 (1.4)†</td>
<td>2.1 (1.5)</td>
</tr>
</tbody>
</table>

Times in succession. The order in which the methods were performed was determined from a random number table. Thus a total of 600 tracheal intubations were attempted. The time from the blade passing the lips of the mannequin to successful placement of the tube was recorded in each case. At the end of each sequence the residents were asked to attach a degree of difficulty to the method, using a scale from 1 = extremely easy to 10 = impossible. The number of failed tracheal intubations was also recorded, defined as one that required more than 60 s or which resulted in oesophageal intubation.

Results were analysed using Wilcoxon’s rank sum test for non-parametric data.

RESULTS

Tracheal intubation was fastest with the flexible fibreoptic device (mean 15 s) (P < 0.001) and this technique was also easier to use than the Bullard with the stylet (degree of difficulty 2.1 cf. 2.9 (P < 0.05)) (table I). Although using the Bullard blade with the wire took longer, it was judged to be as easy as the fibreoptic method.

Fig. 2. Changes in time for tracheal intubation with practice using three different techniques. □ = Bullard + wire; + = Bullard + stylet; ● = fibreoptic device.
Use of the Bullard and wire was associated with the fewest failed intubations, although this was not significant. In all there were two failed intubations with method (1), six with method (2) and none with method (3).

Improvement with practice was apparent with all these methods (fig. 2). The differences between the first five and the second five tracheal intubations were significant for all three methods ($P < 0.05$).

DISCUSSION

The results suggest that no single technique for the management of difficult intubation is learned easily, but any may be improved by practice. In particular, the Bullard laryngoscope was not easier to use than the flexible fibreoptic device with either of the methods used. The Bullard was found also to be less reliable when used with a stylet than with the flexible metallic wire, but the latter method took significantly longer. Although the fibreoptic device proved faster to use, this advantage may be outweighed by the time it takes to prepare the apparatus for use, as the Bullard can be prepared in the same time as an ordinary laryngoscope.

In clinical practice, we have found that the Bullard laryngoscope provides an excellent view of the vocal cords, but passage of a tracheal tube around it is often difficult. The use of the “railroading” technique provides a partial solution, but takes longer. If the reliability of this method can be substantiated in clinical practice it may be useful in situations where no appropriately trained anaesthetist is available.

The Bullard laryngoscope is rugged and less susceptible to damage from misuse. Breakage of this instrument should be rare, in contrast with the flexible device, which is also time consuming to repair. The Bullard has a slight advantage over flexible instruments in terms of cost. The high cost of flexible instruments has been cited as a major reason for the current paucity of anaesthetists in the U.K. familiar with their use [1]. One substantial disadvantage compared with flexible fibreoptic devices is the necessity for the patient to be able to open the mouth before the Bullard can be used.

In conclusion, we have been unable to demonstrate that the Bullard laryngoscope is easier to learn than the flexible device. However, it may provide a reliable alternative to flexible fibreoptic devices.

REFERENCES