

Posture used by anaesthetists during laryngoscopy[†]

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Background. There is little advice on the posture to be used when intubating the trachea. Does the stance used depend on experience?

Methods. Twenty-six subjects with varying experience of intubation were photographed during laryngoscopy of an intubation training mannequin. Posture was measured from the photographs and the data were analysed with the Mann–Whitney *U*-test.

Results. The less experienced group had shallower lines of sight, levered more, and stood with their face closer to the mannequin ($P=0.037$, 0.018 and 0.06 respectively).

Conclusions. Novice anaesthetists should be given explicit instructions on correct trolley height and should be taught to intubate with a straight back.

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When acquiring a new skill, the correct posture is often taught first. Piano teachers are very strict on how we should sit and skiing instructors are equally firm on how we should stand. However, there is little guidance on the posture needed for laryngoscopy and intubation. This study determined whether there are differences in the way more experienced anaesthetists stand when intubating patients, and if this information could lead to advice for those learning to intubate.

Method and results

Twenty-six subjects with varying experience of laryngoscopy were photographed during laryngoscopy of a commonly used intubation mannequin, the Laerdal Airway Management Trainer (Laerdal Medical Corp., Wappingers Falls, NY, USA). The mannequin was placed on a trolley at a fixed height with a single pillow under the head. Participants were asked to visualize the larynx in the normal way, with a size 3 Macintosh laryngoscope. Once they had done so, they were told to hold a stylette along their line of sight. A photograph was taken using a tripod-mounted 35 mm camera placed 2 m directly to the right of the mannequin. The camera, trolley and mannequin were kept in the same position throughout the study. Calibration photographs were taken at regular intervals by photographing a ruler held in the mannequin's sagittal plane, to ensure

that no movement had occurred. This also provided a method for converting measurements taken from the photographs into actual distances.

The following measurements were taken from the photographs (Fig. 1): (A) the angle between the line of sight and the horizontal; (B) the angle between the line of sight and the handle of the laryngoscope (upper edge); (C) the angle between the handle of the laryngoscope and the horizontal; and (D) the distance between the eye and the heel of the laryngoscope. In all cases the base of the training mannequin was taken as horizontal.

The subjects were divided into two groups according to seniority and the data were analysed with the Mann–Whitney *U*-test. $P < 0.05$ was considered significant. Basic statistical calculations were done with Microsoft Excel 2000, while Mann–Whitney *U*-tests were done manually.

Twenty-six subjects took part in the study. One subject was removed from the study on the grounds that he was a significant outlier: he was more than two standard deviations below the mean eye-to-laryngoscope distance and more than three standard deviations below the mean of the experienced group, to which he was allocated. The remain-

[†]This work has been presented to the Liverpool Society of Anaesthetists at the Registrars' Prize Competition 2002. It was awarded first prize.

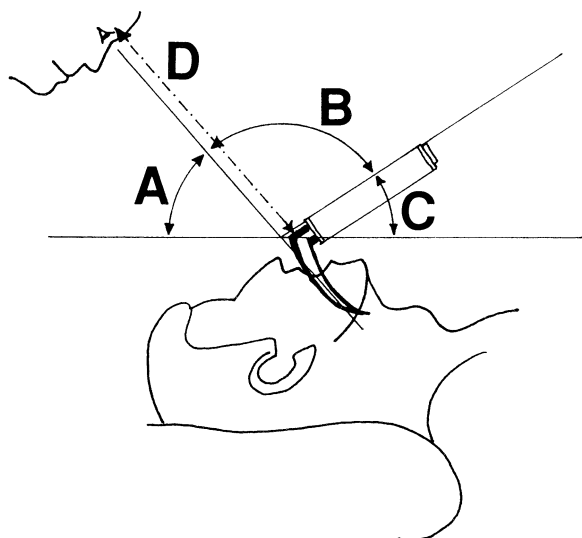


Fig 1 Angles and distances measured from photographs. A is the angle between the line of sight and the horizontal, B is the angle between the line of sight and the handle of the laryngoscope, C is the angle between the handle of the laryngoscope and the horizontal, and D is the distance between the heel of the laryngoscope and the eye.

der were allocated to a more experienced or less experienced group (Table 1). All participants were able to see the glottis. The less experienced group had significantly shallower lines of sight (A) [experienced group, mean (SD) 41.2 (4.8)°; less experienced group, 37.9 (4.2)°; $P < 0.05$; overall range 31–51°]. The more experienced group levered less, with significantly lower laryngoscope handle angles (C) [experienced group, mean 36.6 (5.5)°; less experienced group, 44.1 (7.0)°; $P < 0.05$; overall range 29–57°]. Eye-to-laryngoscope distances (D) were greater in the more experienced group, but the difference did not reach significance [experienced group, 35.6 (9.8) cm; less experienced group, 27.4 (8.7) cm; $P > 0.05$; overall range 19–57 cm]. The angle of the line of sight to the laryngoscope handle was similar in the two groups, and showed a smaller overall range than other measurements [100.4 (3.7)°, range 92–107°]. There was no correlation between line of sight and eye-to-laryngoscope distance.

Comment

These results may not surprise many anaesthetists. Similar work by Matthews and Johnson¹ showed that experienced anaesthetists adopted a more erect posture, with the forearm closer to the horizontal and the anaesthetist's face further from the patient.

One of the most interesting aspects of this study is the limited range of the angle between the laryngoscope handle and the line of sight, which is readily explained by the design of the laryngoscope. Juniors are told not to lever and are warned of broken teeth. These data demonstrate that by

Table 1 Details of the participants and group allocation

Group	Number of subjects
More experienced group	
Consultants	11
Post-fellowship registrars	3
Staff grade	3
Total	17
Less experienced group	
Specialist registrars	1
Senior house officers	3
Nurses	4
Total	8

levering they also lower their line of sight, hence making it more difficult to see.

A lower line of sight caused by levering in turn requires a reduction in height on the part of the anaesthetist. The less experienced group compensated with the upper body, by stooping and bringing their face closer to the patient. This may reduce binocular vision, as noted by Matthews and Johnson.¹ The more experienced group compensated for height with the lower body, by bending their knees or using a similar manoeuvre. One experienced subject compensated by bending his torso laterally, something the author had not seen before.

The poor correlation between low line of sight and low eye-to-laryngoscope distance was disappointing, because the lower sight-line should lead to stooping. However, a major confounding factor was the fixed height of the trolley, which was necessary because of the fixed position of the camera.

Correct trolley height is another factor on which very little is known. Otto² suggests having the patient's head between the anaesthetist's xiphisternum and umbilicus. The author suggests having the trolley surface at the same level as the anaesthetist's anterior superior iliac spines, which results in a similar position.

This study has other defects, apart from the fixed trolley height. The Laerdal Airway Management Trainer is a popular training mannequin, but is not the same as a real subject. It is much less compliant and is more difficult to intubate. Its stiffness means that it is very difficult to intubate on two pillows, as most anaesthetists normally would. However, it gave a 'standard' intubation model, which was identical for all subjects.

Presbyopia was not considered in the study design. However, most of the participants were quite young, so eyesight should not confound the data too much. The decision to remove one of the participants is controversial, but justified on the grounds that a study as small as this would be extremely sensitive to outliers. The criticism that a forced dichotomy has been created between 'more' and 'less' experienced groups is possibly valid; a better design would have been to study consultants against junior SHOs

(senior house officers). However, the limited numbers of participants prevented this.

In spite of the shortfalls, some conclusions are justified. All anaesthetists should place the trolley at the correct height. Juniors should intubate with their back straight and should be taught to manipulate the line of sight by levering less instead of 'chasing' the sight-line by stooping. In situations where the trolley height is fixed, compensation for height should occur with the lower body.

References

- 1 Matthews AJ, Johnson CJH, Goodman NW. Body posture during simulated tracheal intubation. *Anaesthesia* 1998; **53**: 331–4
- 2 Otto CW. Tracheal intubation. In: Nunn JF, Utting JE, Brown BR, eds. *General Anaesthesia*. London: Butterworths, 1989; 512–39