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[Intervention Review]

Videolaryngoscopy versus direct laryngoscopy for adult patients requiring tracheal intubation

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ABSTRACT

Background

Successful tracheal intubation during general anaesthesia traditionally requires a line of sight to the larynx attained by positioning the head and neck and using a laryngoscope to retract the tongue and soft tissues of the floor of the mouth. Difficulties with intubation commonly arise, and alternative laryngoscopes that use digital and/or fibreoptic technology have been designed to improve visibility when airway difficulty is predicted or encountered. Among these devices, a rigid videolaryngoscope (VLS) uses a blade to retract the soft tissues and transmits a lighted video image to a screen.

Objectives

Our primary objective was to assess whether use of videolaryngoscopy for tracheal intubation in adults requiring general anaesthesia reduces risks of complications and failure compared with direct laryngoscopy. Our secondary aim was to assess the benefits and risks of these devices in selected population groups, such as adults with obesity and those with a known or predicted difficult airway.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE and Embase on 10 February 2015. Our search terms were relevant to the review question and were not limited by outcomes. We carried out clinical trials register searches and forward and backward citation tracking. We reran the search on 12 January 2016; we added potential new studies of interest from the 2016 search to a list of 'Studies awaiting classification', and we will incorporate these studies into the formal review during the review update.

Selection criteria

We considered all randomized controlled trials and quasi-randomized studies with adult patients undergoing laryngoscopy performed with a VLS or a Macintosh laryngoscope in a clinical, emergency or out-of-hospital setting. We included parallel and cross-over study designs.

Data collection and analysis

Two review authors independently assessed trial quality and extracted data, consulting a third review author to resolve disagreements. We used standard Cochrane methodological procedures, including assessment of risk of bias.

Main results

We included 64 studies identified during the 2015 search that enrolled 7044 adult participants and compared a VLS of one or more designs with a Macintosh laryngoscope. We identified 38 studies awaiting classification and seven ongoing studies. Of the 64 included studies, 61 included elective surgical patients, and three were conducted in an emergency setting. Among 48 studies that included participants without a predicted difficult airway, 15 used techniques to simulate a difficult airway. Seven recruited participants with a known or predicted difficult airway, and the remaining studies did not specify or included both predicted and not predicted difficult airways. Only two studies specifically recruited obese participants. It was not possible to blind the intubator to the device, and we noted a high level of inevitable heterogeneity, given the large number of studies.

Statistically significantly fewer failed intubations were reported when a VLS was used (Mantel-Haenszel (M-H) odds ratio (OR), random-effects 0.35, 95% confidence Interval (CI) 0.19 to 0.65; 38 studies; 4127 participants), and fewer failed intubations occurred when a VLS was used in participants with an anticipated difficult airway (M-H OR, random-effects 0.28, 95% CI 0.15 to 0.55; six studies; 830 participants). We graded the quality of this evidence as moderate on the basis of the GRADE system. Failed intubations were fewer when a VLS was used in participants with a simulated difficult airway (M-H OR, random-effects 0.18, 95% CI 0.04 to 0.77; nine studies; 810 participants), but groups with no predicted difficult airway provided no significant results (M-H OR, random-effects 0.61, 95% CI 0.22 to 1.67; 19 studies; 1743 participants).

Eight studies reported on hypoxia, and only three of these described any events; results showed no differences between devices for this outcome (M-H OR, random-effects 0.39, 95% CI 0.10 to 1.44; 1319 participants). Similarly, few studies reported on mortality, noting no differences between devices (M-H OR, fixed-effect 1.09, 95% CI 0.65 to 1.82; two studies; 663 participants), and only one study reporting on the occurrence of respiratory complications (78 participants); we graded these three outcomes as very low quality owing to lack of data. We found no statistically significant differences between devices in the proportion of successful first attempts (M-H OR, random-effects 1.27, 95% CI 0.77 to 2.09; 36 studies; 4731 participants) nor in those needing more than one attempt. We graded the quality of this evidence as moderate. Studies reported no statistically significant differences in the incidence of sore throat in the postanaesthesia care unit (PACU) (M-H OR, random-effects 1.00 (95% CI 0.73 to 1.38); 10 studies; 1548 participants) nor at 24 hours postoperatively (M-H OR random-effects 0.54, 95% CI 0.27 to 1.07; eight studies; 844 participants); we graded the quality of this evidence as moderate. Data combined to include studies of cross-over design revealed statistically significantly fewer laryngeal or airway traumas (M-H OR, random-effects 0.68, 95% CI 0.48 to 0.96; 29 studies; 3110 participants) and fewer incidences of postoperative hoarseness (M-H OR, fixed-effect 0.57, 95% CI 0.36 to 0.88; six studies; 527 participants) when a VLS was used. A greater number of laryngoscopies performed with a VLS achieved a view of most of the glottis (M-H OR, random-effects 6.77, 95% CI 4.17 to 10.98; 22 studies; 2240 participants), fewer laryngoscopies performed with a VLS achieved no view of the glottis (M-H OR, random-effects 0.18, 95% CI 0.13 to 0.27; 22 studies; 2240 participants) and the VLS was easier to use (M-H OR, random-effects 7.13, 95% CI 3.12 to 16.31; seven studies; 568 participants).

Although a large number of studies reported time required for tracheal intubation (55 studies; 6249 participants), we did not present an effects estimate for this outcome owing to the extremely high level of statistical heterogeneity (I^2 = 96%).

Authors' conclusions

Videolaryngoscopes may reduce the number of failed intubations, particularly among patients presenting with a difficult airway. They improve the glottic view and may reduce laryngeal/airway trauma. Currently, no evidence indicates that use of a VLS reduces the number of intubation attempts or the incidence of hypoxia or respiratory complications, and no evidence indicates that use of a VLS affects time required for intubation.

PLAIN LANGUAGE SUMMARY

Videolaryngoscopes to guide the insertion of breathing tubes in adult surgical patients

Background

Patients requiring general anaesthesia need assistance with breathing during the operation. To provide this assistance, the anaesthetist may insert a tube through the mouth or nose and down the trachea (windpipe) into the lungs. For this procedure, which is known as tracheal intubation, the anaesthetist usually uses a metal instrument called a laryngoscope to move the tongue and soft tissues of the mouth so s/he can see the vocal cords directly before intubation. However, seeing the vocal cords may be difficult, for example, when the patient has restrictions on neck movement, and any difficulty in intubation may lead to complications for the patient. Other laryngoscopes, called videolaryngoscopes, use video technology and may improve the anaesthetist's view before intubation. This technology allows the anaesthetist to actually see the position of the tube on a video screen while it is being inserted. This review aimed to assess whether videolaryngoscopes reduce the risks of complications and intubation failure.

Study characteristics

Evidence is current up to 10 February 2015. We found 64 studies with 6895 participants. Studies compared anaesthetists using different types of videolaryngoscopes with anaesthetists using a standard Macintosh laryngoscope without the video feature. We reran the search on 12 January 2016 and will deal with new studies of interest when we update the review.

Key results

We combined the results of studies using statistical tests and found fewer failed intubations requiring intubation with the alternative device when a videolaryngoscope was used with patients, including those with a difficult airway, than when a standard laryngoscope was used. Participants were also less likely to have minor injuries to their mouth/throat or to experience hoarseness after surgery. Anaesthetists had an improved view before intubation and assessed the videolaryngoscope as easier to use than a standard laryngoscope. Researchers reported no differences in the number of adult participants with a sore throat and no differences in the number of successful first attempts or in the overall number of attempts. We were unable to combine data to compare studies statistically for the time taken to use a videolaryngoscope owing to the number of differences in measured time points. We identified 38 studies for possible inclusion and will assess these studies during the review update.

Quality of the evidence

Although we noted good methods in some of the studies, it was not possible for researchers to mask the anaesthetist to the type of laryngoscope used, and we believe that this could have compromised the quality of the evidence in favour of either type of laryngoscope.

Conclusions

Evidence suggests that videolaryngoscopes may improve the success of tracheal intubation, particularly when the patient has a difficult airway.