Comparison of video laryngoscopes with direct laryngoscopy for tracheal intubation: a meta-analysis of randomised trials
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CRD summary
The review concluded that video laryngoscopes were a good alternative to direct laryngoscopy during tracheal intubation; the advantage seemed to be more prominent when difficult intubation was encountered. The review had some methodological issues and data limitations. The conclusion regarding successful intubation seems reliable. Other conclusions may not be reliable given the evidence presented.

Authors' objectives
To compare video laryngoscopes with direct laryngoscopy for tracheal intubation.

Searching
PubMed and EMBASE were searched to September 2010 without language restrictions. Search terms were reported. Reference lists of retrieved articles were searched.

Study selection
Randomised controlled trials (RCTs) of video laryngoscopes versus direct laryngoscopy for tracheal intubation were eligible for inclusion. Trials had to report time to intubation, success rate of intubation and quality of the glottic view. Manikin studies and cross-over studies were excluded.

The included trials studied video laryngoscopes versus direct laryngoscopy for tracheal intubation in patients scheduled to undergo elective surgical interventions. The type of video laryngoscope varied. Most trials used GlideScope; some also studied Storz, X-Lite, McGrath and Pentax-AWS. All trials were conducted in the operating room setting by anaesthesiologists (experienced and novice). Mean age of patients ranged from 2.4 years to 56.5 years. Most trials did not have a difficult intubation and four trials did. Definitions of failed intubation varied.

The authors did not state how many reviewers performed study selection.

Assessment of study quality
The authors did not state that they performed quality assessment.

Data extraction
Data were extracted on time to intubation, success rate of intubation and quality of the glottic view. These data were used to calculate relative risks (RRs) and mean differences, with 95% confidence intervals (CIs).

Two reviewers independently extracted data. Disagreements were resolved by discussion. Trial authors were contacted for missing data.

Methods of synthesis
DerSimonian and Laird random-effects meta-analysis was used to calculate pooled relative risks and standardised mean differences (SMDs), with 95% CIs. Statistical heterogeneity was assessed using the I² statistic. Sensitivity analysis excluded one study at a time. Meta-regression was performed to explore possible heterogeneity based on predefined study variables and the Monte Carlo permutation test for single covariate meta-regression was applied to the adjusted results. Significant variables were explored subsequently in subgroup analysis. Publication bias was assessed using Egger’s and Begg’s tests.

Results of the review
Eleven RCTs were included in the review (1,196 patients, range 56 to 203). None of the studies were assessor blinded.
Compared with direct laryngoscopy, video laryngoscopes were not associated with statistically significant differences in time to intubation (SMD 0.26, 95% CI -0.27 to 0.78; P=95%; 11 RCTs) and successful intubations (RR 1.00, 95% CI 0.99 to 1.01; P=0%; 11 RCTs). Glottic view was significantly improved in eight out of nine trials.

Sensitivity analysis for time to intubation did not significantly alter the results. Meta-regression indicated that difficult intubation influenced the time to intubation. Trials in patients with difficult intubation had a shorter time to intubation with video laryngoscope (SMD -0.75, 95% CI -1.24 to -0.25; P=83%; four RCTs). Trials in patients without a difficult intubation indicated the reverse, with adult patients having a longer intubation time with video laryngoscope (SMD 1.16, 95% CI 0.93 to 1.38; P=3%; three RCTs).

Types of video laryngoscope, experience of anaesthesiologists and age group were not statistically significant in the meta-regression.

There was no evidence of publication bias.

**Authors' conclusions**
Compared with direct laryngoscopy, video laryngoscopes provided a better view of the glottis, a similarly high rate of successful intubation and a shorter time to intubation when difficulty was encountered.

**CRD commentary**
Inclusion criteria for the review were defined clearly. Two relevant data sources were searched. There were no language restrictions. Publication bias was assessed and was not detected. Attempts were made to reduce reviewer error and bias during data extraction but it was not clear whether the same methods were used for study selection. There did not appear to be a quality assessment which made assessing the quality of the evidence base difficult; the authors noted that none of the trials blinded assessors.

The authors noted that there were differences across the trials for definition of intubation failure, type of video device and age of patients, which may have influenced the results. Trials were combined using standard statistical techniques. Statistical heterogeneity was assessed appropriately. There was significant statistical heterogeneity in the analysis of time to intubation. The results for glottis view were not fully presented, which made it difficult to assess the reliability. The results for time to intubation were based on subgroup analyses, which affected the reliability of the findings. There were some discrepancies between results presented in the text, tables and figures.

The conclusion regarding successful intubation seems reliable. Other conclusions may not be reliable given the evidence presented.

**Implications of the review for practice and research**
**Practice**: The authors stated that the findings may not be generalisable to locations other than the operating theatre.

**Research**: The authors stated that future studies should clearly specify intubators, devices, definitions of time to intubation, failed intubation and number of attempts.

**Funding**
None.

**Bibliographic details**

**PubMedID**
21897263

**Linked records**
- Comparison of video and direct laryngoscope for tracheal intubation in emergency settings: a meta-analysis

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