CRD summary
This review concluded that minimally-invasive video-assisted thyroidectomy was as safe as open thyroidectomy for small thyroid nodule resection short-term adverse events and, although it took significantly longer operative time, it was associated with reduced immediate postoperative pain and better cosmetic results. Although this well-conducted review was based on a small number of trials, it is likely to be reliable.

Authors' objectives
To compare the safety and efficacy of minimally invasive video-assisted thyroidectomy with open thyroidectomy for small thyroid nodules.

Searching
PubMed, EMBASE and the Cochrane Library were searched for studies published in English between 1999 and 2007. Search terms were reported.

Study selection
Randomised controlled trials (RCTs) that reported clinical outcomes for a comparison of minimally invasive video-assisted thyroidectomy and open thyroidectomy for either thyroid nodular disease or low risk papillary carcinoma were eligible for inclusion. Trials were excluded from the review if thyroid nodules exceeded 35 to 40mm in diameter, thyroid volume exceeded 20 to 25mL, or patients with thyroiditis, cervical irradiation or previous neck surgery were included in the trial.

The primary outcomes of interest were occurrence of adverse events (transient palsy and transient hypoparathyroidism) and cosmetic skin result score. Secondary outcomes were operative time, blood loss, and visual analogue scale (VAS) for pain at six, 24 and 48 hours.

The proportions of patients undergoing total thyroidectomy and thyroid lobectomy varied between trials; two trials included patients with papillary carcinoma. Most of the included patients were female and their mean age ranged from 37 to 52 years.

Study selection was performed by two reviewers working independently, and disagreements were decided by consensus.

Assessment of study quality
Trial quality was assessed using the Jadad 5-point scale which considered randomisation, blinding, and withdrawals and drop-outs.

The authors did not state how the validity assessment was performed.

Data extraction
Outcome data were extracted in order to calculate odds ratios (OR) for dichotomous outcomes and weighted mean differences (WMD) for continuous outcomes. Where necessary, trial authors were contacted for further information.

The review authors did not state how the data were extracted for the review.

Methods of synthesis
Trials were combined using meta-analysis. Pooled estimates of outcome measures were calculated using a fixed-effect model. Where a $\chi^2$ test indicated significant heterogeneity among the trials, the estimate was also calculated using a
random-effects model. The $I^2$ statistic was also used to assess heterogeneity. Sensitivity analyses were performed to investigate the influence of individual trials on the results. Publication bias was assessed using funnel plots.

**Results of the review**

Five RCTs (n=310 patients) were included in the review. Two trials were judged to be of high quality (Jadad score of 3 points or more) and three trials low quality.

Among perioperative outcomes, minimally invasive video-assisted thyroidectomy was associated with significantly greater operative time than open thyroidectomy (WMD 18.77 minutes, 95% CI 17.09 to 20.45; four RCTs), but involved significantly less pain (VAS measured on a 100-point scale) at six hours postoperatively (WMD -11.57, 95% CI -17.50 to -5.64; three RCTs). Reductions in blood loss and pain scores at 24 hours and 48 hour postoperatively with minimally invasive video-assisted thyroidectomy were not statistically significant using the random-effects model (necessary due to the heterogeneity present).

Among short-term outcomes, the cosmetic result (measured on a scale of 0 to 10) was significantly better with minimally invasive video-assisted thyroidectomy than open thyroidectomy (WMD 1.86, 95% CI 0.03 to 3.69; three RCTs), and there were no significant differences between the two methods in occurrence of transient palsy or transient hypoparathyroidism.

Heterogeneity in late postoperative pain and cosmetic results outcomes were investigated, and sensitivity analyses were performed involving the removal of one particularly influential trial. This led to the pain score at 24 hours becoming statistically significant in favour of minimally invasive video-assisted thyroidectomy, but the statistical significance of other outcomes were unaffected.

Evidence of possible publication bias was detected in results for VAS at 24 hours and 48 hours, and not for operative time, transient palsy or hypoparathyroidism, but the other outcomes involved too few trials to assess this bias.

**Authors’ conclusions**

Compared to open thyroidectomy, minimally invasive video-assisted thyroidectomy was similarly safe in terms of short-term adverse events and, although it took significantly longer operative time, it was associated with reduced immediate postoperative pain and better cosmetic results.

**CRD commentary**

The review addressed a clear question with inclusion criteria that appeared to be clinically appropriate. Only published English-language studies were sought, so possible relevant studies may be been missed. The authors did investigate publication bias and also stated in their discussion that a search of non-English literature yielded no relevant abstracts. Trials were selected by two reviewers independently, which should have minimised the introduction of errors and bias at this stage. However, it was unclear whether quality assessment and data extraction were performed to the same standard.

The review included sufficient details of the individual trials; their methodological quality was assessed using a validated tool. Appropriate statistical methods were used for meta-analysis and to assess and investigate heterogeneity. The authors provided detailed results and a thorough discussion of these and of the limitations of their review.

The main limitation of the review was the small number of trials, particularly for some outcomes. However, the review was well conducted and reported, and the conclusions are likely to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that there is a need for larger RCTs with a longer follow-up especially for patients known to have cancer preoperatively.
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