Hemostasis in thyroid surgery: harmonic scalpel versus other techniques - a meta-analysis

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CRD summary
The authors concluded that harmonic scalpel use for haemostasis in thyroid surgery significantly reduced operating time and blood loss and did not increase the volume of drainage fluid, complication rate or hospital stay. The authors’ conclusions reflected the evidence, but limitations in review methods, small numbers for some outcomes and differences between trials may weaken the strength of this evidence.

Authors' objectives
To compare the harmonic scalpel with other haemostatic techniques in patients undergoing thyroid surgery.

Searching
MEDLINE and the Cochrane Library were searched up to November 2008 for studies published in English or German. Search terms were reported. Reference lists were also screened.

Study selection
Randomised controlled trials (RCTs) were eligible if they compared the harmonic scalpel with other haemostatic methods in adults (aged over 18 years) with benign and/or malignant thyroid diseases who were undergoing different types of thyroid surgery. Eligible haemostatic technique comparators were suture or clip ligation, electrocautery, or electrothermal vessel sealing system.

Outcomes of interest were operating time, intraoperative blood loss, volume of drainage fluid, postoperative complications, postoperative pain, and length of hospital stay.

Included trials compared the harmonic scalpel with classic suture ligation, suture/clip ligation combined with electrocautery, and electrothermal bipolar vessel sealing system. In just over half of the included trials, patients underwent total thyroidectomy; in other trials, patients underwent total or partial thyroidectomy, or a minimally invasive video-assisted thyroidectomy. Most trials were conducted in European countries.

Two reviewers independently selected studies.

Assessment of study quality
One reviewer assessed included trial methodological quality using methods and timing of randomisation, number of patients randomised and not randomised, blinding, sample size, description of withdrawals, and power calculation.

Data extraction
One reviewer extracted data onto a standardised data sheet.

Methods of synthesis
The authors stated that, because of heterogeneity, a random-effects model was used to pool data. Weighted mean differences (WMD) were used for continuous data and odds ratios (OR) for dichotomous data; 95% confidence intervals (CIs) were also presented. According to forest plots, heterogeneity was assessed using the $I^2$ and $T^2$ statistics.

The influence of the type of comparison intervention was examined using subgroup analysis.

Publication bias was assessed using funnel plots.

Results of the review
Twelve RCTs were included (n= 1,153 patients). Sample size ranged from 33 to 200. Seven trials reported adequate
methods and timing of randomisation. One trial reported blinding of the clinical assessor; three trials reported patient blinding. Six trials reported sample size calculation. Ten trials reported no withdrawals or crossovers to the alternative intervention. Four trials reported power analysis on an intention-to-treat basis.

Harmonic scalpel versus other haemostatic methods: Use of the harmonic scalpel was associated with a significant reduction in mean operating time (WMD -22.67 minutes, 95% CI -29.98 to -17.37; $I^2=87\%$), blood loss (WMD -20.03 mL, 95% CI -27.83 to -12.22; $I^2=62\%$), postoperative pain (WMD -0.86 points, 95% CI -1.60 to -0.13; $I^2=77\%$) and length of hospital stay (WMD -0.12 days, 95% CI -0.25 to -0.00; $I^2=0\%$). There was no significant difference between harmonic scalpel and other methods in the volume of drainage fluid or complications.

Harmonic scalpel versus classic suture ligation (three RCTs): Use of the harmonic scalpel was associated with a significant reduction in mean operating time compared with classic suture ligation (WMD -17.56 minutes, 95% CI -20.73 to -14.39; three RCTs; $I^2=6\%$). One trial reported a reduction in length of stay in the harmonic scalpel group. There was no significant difference between harmonic scalpel and classic suture ligation in blood loss or complications.

Harmonic scalpel versus suture or clip ligation combined with electrocautery (nine RCTs): Use of the harmonic scalpel was associated with a significant reduction in mean operating time (WMD -23.41 minutes, 95% CI -31.1 to -15.7; nine RCTs; $I^2=91\%$), blood loss (WMD -24.23 mL, 95% CI -34.4 to -14.1; five studies, $I^2=56\%$), postoperative pain (WMD -0.86 points, 95% CI -1.60 to -0.13; three RCTs, $I^2=77\%$) and a non significant reduction in length of stay (WMD -0.12 days, 95% CI -0.26 to 0.01; $I^2=0\%$). There was no significant difference between interventions in volume of drainage fluid or complications.

Harmonic scalpel versus electrothermal bipolar vessel sealing system (one RCT): Use of the harmonic scalpel was associated with a significant reduction in mean operating time (WMD -35 minutes, 95% CI -46.1 to -23.9) and blood loss (WMD -14 mL, 95% CI -24.8 to -3.2). There was no significant difference between interventions in complications.

The funnel plot was asymmetrical suggesting the possibility of publication bias.

Authors’ conclusions
There was clear evidence that use of the harmonic scalpel for haemostasis in thyroid surgery significantly reduced operating time and blood loss, and was not associated with an increase in the volume of drainage fluid, complication rate or length of hospital stay.

CRD commentary
The review question was clearly stated and inclusion criteria were appropriately defined. The search was limited to two databases and no attempts were made to minimise publication bias; the funnel plot was suggestive of publication bias. Methods were used to minimise reviewer errors and bias in the selection of studies, but only one reviewer extracted data and assessed validity, which may have resulted in reviewer error and bias.

Trial quality was assessed and results were reported. Data were pooled using random-effects models in the presence of significant heterogeneity for many of the analyses. For most outcomes, trials showed similar directions of treatment effect, but the significant heterogeneity meant that summary measures of treatment effect may not be reliable. The authors acknowledged that trials were clinically heterogeneous, particularly in the pathology of thyroid disease.

The authors’ conclusions appeared to reflect the evidence, but limitations in review methods, small patient numbers for some outcomes and differences between trials may weaken the strength of this evidence.

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 the need for further research into potential cost savings using the harmonic scalpel.
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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.