Systematic review and meta-analysis of cutting diathermy versus scalpel for skin incision

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CRD summary
This review found that surgical incisions made using cutting diathermy were associated with decreased blood loss and quicker incision times compared to incisions made using scalpels. High levels of variation in the results and unclear risk of bias across the trials means the reliability of the authors' conclusions is unclear.

Authors' objectives
To compare the outcomes of cutting diathermy skin incision and scalpel skin incision for all operations.

Searching
MEDLINE and The Cochrane Library were searched to June 2011 for relevant studies in any language; search terms were reported. Reference lists of relevant articles were checked for further relevant articles.

Study selection
Randomised controlled trials in which cutting diathermy was compared with use of scalpels for skin incisions for any type of surgical operation were eligible for inclusion. Eligible trials were required to report data on the primary outcomes of wound complications, incision time, incision-related blood loss and postoperative pain.

The included trials were published between 1988 and 2011; half were published prior to 1995. Most of the trials examined outcomes after abdominal surgery; other studies compared outcomes after hemiarthroplasty for hip fracture and neck incisions. Postoperative wound complications included all types of major or minor wound problems (including haematoma, seroma, infection and dehiscence). Incision time was defined as the time to make the skin incision and achieve haemostasis. Blood loss was measured by weighing swabs used from incision to haemostasis. Pain scores were measured using a 10-point visual or verbal analogue scale.

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

Assessment of study quality
Methodological quality was assessed by two independent reviewers using the Jadad five-point scale of randomisation, blinding and reporting of withdrawals and losses to follow-up.

Data extraction
Data were extracted by two independent reviewers to calculate odds ratios (OR) for dichotomous outcomes and mean differences for continuous outcomes, each with 95% confidence intervals (CI).

Methods of synthesis
Pooled odds ratios, weighted mean differences (WMD) and 95% CIs for the summary estimates were calculated using a Mantel-Haenszel fixed-effect model. Statistical heterogeneity was assessed using $I^2$ and $X^2$ ($p<0.05$ was used to indicate statistical significance rather than the more commonly used $p<0.10$). A random-effects model was used in most analyses where heterogeneity was present. The authors did not state criteria for use of random-effects and fixed-effect models.

Results of the review
Fourteen randomised controlled trials (2,541 participants, range 38 to 492) were included in the review. Two trials scored 5 on the Jadad scale, four scored 3, six scored 2 and two scored 1 out of a maximum 5. Median length of follow-up across the studies was six weeks (range four days to 19 months).

Statistically significant benefits were observed for cutting diathermy with shorter incision times (WMD 36.19 seconds, 95% CI 22.77 to 49.61; $I^2=92$%; eight trials) and blood loss (WMD -0.72mL/cm², 95% CI 0.43 to 1.01; $I^2=100$%, four trials). There was a marginal difference in postoperative pain recorded 24 hours post surgery (WMD 0.89, 95% CI 0 to 1.77; $I^2=100$%; five studies).
Cutting diathermy was associated with statistically significant benefits compared to scalpel incisions in analyses that reported incision times relative to wound size (WMD -1.73 seconds/cm², 95% CI -3.27 to -0.19; I²=99%).

There were no significant differences between incision types in incidence of wound complications and no statistically significant heterogeneity reported for this outcome.

**Authors' conclusions**
Use of cutting diathermy for operative skin incisions was quicker and associated with significantly less blood loss than incisions made by scalpels. There were no differences between incision techniques for wound complication rates and postoperative pain.

**CRD commentary**
The review addressed a clearly defined question. Criteria for study inclusion were outlined. Two appropriate databases were searched for relevant studies. There were no language restrictions. Few attempts were made to identify unpublished studies so there was some possibility of publication bias. Steps were taken to minimise reviewer error and bias for data extraction and assessment of methodological quality; no such methods were reported for study selection. Methodological quality was assessed using a basic tool that did not evaluate allocation concealment methods (a known potential source of important bias in randomised trials). The included trials were found to vary widely in quality and the authors did not use the results of the quality assessment to help inform the reliability of the results from the meta-analyses. High levels of statistical heterogeneity were reported for all statistically significant outcomes but the reviewers did not explore potential sources of heterogeneity using subgroup or sensitivity analyses.

The authors’ conclusions were based on the evidence presented but the high levels of statistical heterogeneity and unclear risk of bias across the trials mean that the results should be interpreted with some caution and their reliability is unclear.

**Implications of the review for practice and research**
**Practice:** The authors stated that efficacy, safety and the ability to use the same instrument for dividing muscle and fascia may make cutting diathermy an alternative to scalpel use for surgeons.

**Practice:** The authors stated that further research was required to determine long-term effects of diathermy on cosmesis. In addition, the relationship between cutting diathermy compared to scalpel and pain requires further research.

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