Systematic review and meta-analysis of electrocautery versus scalpel for surgical skin incisions

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CRD summary
The authors concluded there were no significant differences in wound infection rates or scar appearance between electrocautery and scalpel for surgical skin incisions. Electrocautery significantly reduced the incision time and postoperative wound pain, with a trend towards less incisional blood loss. The small number of variable trials included and a limited search mean that these conclusions should be interpreted tentatively.

Authors' objectives
To determine the safety and effectiveness of electrocautery in creating skin incisions compared with a traditional scalpel.

Searching
PubMed was searched from inception. Search terms were presented. Reference lists of relevant articles were scanned for additional studies.

Study selection
Eligible for inclusion were randomised controlled trials (RCTs) that compared electrocautery with a scalpel in patients undergoing surgical skin incisions (epidermis and dermis). The primary outcomes of interest were postoperative wound infection (according to criteria from the Centers for Disease Control, reported in the paper) and scar cosmesis. Eligible secondary outcomes were intraoperative blood loss, incision time, and postoperative pain. Trials were excluded if a mixture of scalpel and electrocautery techniques were used.

Included trials were located worldwide with one conducted in the UK. The types of surgery undertaken included general surgery, otolaryngology, and neurosurgery. All except one trial used the cutting setting when using electrocautery. Outcome measures included the Patient Observer Scar Assessment Scale, Visual Analogue Scale, Verbal Rating Scale, and Vancouver Scar Scale.

Two reviewers independently selected the studies for inclusion. Discrepancies were resolved by consensus.

Assessment of study quality
Trial quality was assessed using the following criteria: randomisation, allocation concealment, blinding, and completeness of follow-up.

The authors did not state how many reviewers were involved in the quality assessment.

Data extraction
Data were extracted to enable the presentation of risk ratios (RR) or mean differences (MD), with 95% confidence intervals (CI).

It was unclear how many reviewers carried out the process of data extraction.

Methods of synthesis
Relative risks and weighted mean differences (WMD) were pooled in a random-effects meta-analysis, where possible. Statistical heterogeneity was reported as a p-value.

Publication bias was assessed using a funnel plot.

Results of the review
Six RCTs (1,234 patients; sample size 38 to 369) were included in the review. Five trials were rated as having a low risk of bias. All except one trial reported adequate randomisation. Half of the trials met the criteria for allocation.
concealment and blinding. Four trials reported adequate follow-up.

There was no statistically significant difference between the surgical skin incision techniques in the pooled analysis for infection rate (five RCTs; heterogeneity not reported). There was no evidence of publication bias. A pooled result was not possible for wound cosmesis, as only one trial reported results for this outcome. In this trial, the difference between techniques was not statistically significant.

A statistically significant outcome for incision time favoured electrocautery over scalpel use (WMD -28.56 seconds, 95% CI -48.35 to -8.76; two RCTs; significant heterogeneity).

There was a trend in favour of electrocautery for lower incisional blood loss, but the pooled analysis failed to reach statistical significance (three RCTs; significant heterogeneity).

There was a trend favouring electrocautery for less postoperative incisional pain, but meta-analysis could not be carried out.

**Authors' conclusions**

No significant difference in wound infection rates or scar cosmesis was identified between the electrocautery and conventional scalpel for surgical skin incisions. Electrocautery significantly reduced the incision time and postoperative wound pain. A trend towards less incisional blood loss with electrocautery was noted.

**CRD commentary**

The review question was clear. Inclusion criteria were adequately detailed to allow replication. A limited search was carried out and there was no indication that unpublished material was sought, so potentially relevant studies could have been missed. However, publication bias was assessed and found not to be a threat (for wound infection). The selection of studies was carried out with steps to minimise error and bias, but it was unclear whether this was the case for the remainder of the review process.

An appropriate quality assessment tool was used; the results of this suggested that included trials were of reasonable quality. Patient characteristics were not reported, which limited the generalisability of the results. Some reporting discrepancies were noted for study citations. Statistical heterogeneity was assessed. The chosen method of synthesis seemed appropriate, although (as the authors acknowledged) pooling a small number of variable trials represented a limitation of the review.

The small number of variable trials included, together with a limited search, means that the authors' conclusion and implication for practice should be interpreted tentatively.

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

**Practice:** The authors stated that electrocautery was a safe and effective method for carrying out skin incisions. Appropriate training in the use of electrocautery was vital in achieving safety and cosmetic outcomes.

**Research:** The authors stated that a larger randomised trial was needed to evaluate wound infection and wound cosmesis. Future research should also facilitate the comparison of different surgical approaches by reporting incisional time per centimetre of incisional length.

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Record Status
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.