Meta-analysis of the effectiveness of surgical scalpel or diathermy in making abdominal skin incisions

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CRD summary
The authors concluded that rates of wound infection were similar for abdominal incisions made with cold scalpel and diathermy. Routine use of diathermy was supported by reduced postoperative pain, shorter incision times and reduced blood loss. Given the limited search, the poor quality of included trials and weaknesses in the analyses, the authors' conclusions should be treated with caution.

Authors' objectives
To compare the effectiveness of cold scalpel and diathermy in making abdominal skin incisions.

Searching
MEDLINE and the Cochrane Library were searched for trials published in any language. Search terms were reported. References were handsearched.

Study selection
Prospective trials that compared cold scalpel with diathermy for making abdominal incisions were eligible for inclusion. The primary endpoint eligible for inclusion was postoperative wound infection. Secondary end-points were time taken to complete the incision, incision-related blood loss and subjective pain score post-surgery.

In included trials participants underwent cholecystectomy, inguinal hernia cholecystectomy, hysterectomy, inguinal herniorrhaphy, midline abdominal, thorax and general incisions. Trials were conducted in the UK, USA, Saudi Arabia, Canada, Italy, Ireland, Greece and Pakistan.

It was unclear how many reviewers were involved in the whole study selection process.

Assessment of study quality
The quality of included trials was assessed using a three-item Jadad scale (randomisation, blinding and withdrawals/drop-outs). The scale gave a score that ranged from 0 to 5, where 5 indicated a high-quality study.

The authors did not state how many reviewers performed the quality assessment.

Data extraction
The number of postoperative wound infections in each group was extracted and used to calculate odds ratios (ORs) with 95% confidence intervals (CIs). The mean difference between groups for amount of blood loss and time taken to complete the incision were calculated for each trial. As pain scores were reported for different time periods, the mean and standard deviation of pain score was estimated at 24 hours after surgery on a standardised scale of 0 to 10. The mean difference between groups in the standardised pain score was calculated.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
For wound infection, pooled odds ratios with 95% confidence intervals were calculated. For time taken to make the incision and blood loss, standardised mean differences with 95% confidence intervals were calculated. For 24 hour postoperative pain scores, weighted mean differences (WMDs) with 95% confidence intervals were calculated.

Where there was evidence of significant statistical heterogeneity, a random-effects model was used. Where there was no evidence of significant heterogeneity, a fixed-effect model was used.

Sensitivity analyses were carried out excluding each trial in turn.
Publication bias was assessed using funnel plots and the fail safe number.

**Results of the review**

Eleven trials were included for review, with over 3,122 participants. There were nine randomised controlled trials and two non-randomised controlled trials (number of participants not available). Two trials scored 0 points on the Jadad scale for quality, two scored 1 point, three scored 2 points, three scored 3 points and one scored 5 points. Follow-up ranged from seven days to three years (where reported).

There was no significant difference between cold scalpel and diathermy for postoperative wound infection rate (OR 1.26; 95% CI 0.92 to 1.71; eight trials). There was no evidence of heterogeneity ($I^2=0\%$).

Pain scores 24 hours after operation were significantly lower with diathermy compared with cold scalpel (WMD 0.85, 95% CI 0.08 to 1.63; six trials). There was evidence of substantial heterogeneity ($I^2=93.6\%$).

There was significantly shorter incision time (SMD 0.37, 95% CI 0.25 to 0.50; seven trials; $I^2=27.9\%$) and less incision-related blood loss with diathermy incisions (SMD 0.78, 95% CI 0.55 to 1.02; five trials; 52.9%). There was evidence of moderate heterogeneity for these outcomes.

Sensitivity analyses excluding individual trials did not alter the outcomes for wound infection, blood loss or time taken for incision. When two trials were excluded from the postoperative pain analysis, results showed no significant differences between groups.

The authors reported that there was no evidence of publication bias.

**Authors' conclusions**

Rates of wound infection were similar for incisions made with cold scalpel and diathermy. Routine use of diathermy was supported by reduced postoperative pain, shorter incision times and reduced blood loss.

**CRD commentary**

The review addressed a clear question with well-defined inclusion criteria. However, the reviewers stated that there was lack of uniform inclusion criteria in the included trials; this may have indicated bias in the study selection procedure and limited the generalisability of the findings from these trials. The search was restricted to two databases, so important data may have been omitted. The search was conducted for articles in any language, which minimised the risk of language bias. Publication bias was assessed and ruled out. However, the use of a funnel plot to assess publication bias in a small number of trials may not have been reliable. It was unclear whether appropriate steps were taken during the review process to minimise reviewer error and bias.

A quality assessment of included trials was carried out, but this was not a suitable tool to assess the non-randomised trials. The quality of included trials was generally low. Randomised and non-randomised trials were combined in the meta-analysis, which undermined the reliability of these results. It was unclear whether the methods used to estimate 24-hour pain scores were appropriate; heterogeneity for this outcome was high and the removal of two trials altered the findings. Therefore, the analysis for postoperative pain may have been unreliable.

Given the limited search, the poor quality of included trials and weaknesses in the analyses, the authors’ conclusions should be treated with caution.

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

**Practice:** The authors stated that potential complications of diathermy should be weighed against their benefits but that the transition to use of diathermy should continue. The present review did not assess the risks of complications with diathermy.

**Research:** The authors stated that further prospective trials were needed comparing the impact of cold scalpel and diathermy on scarring.

**Funding**

Not stated.
Bibliographic details

PubMedID
21135691

DOI
10.1097/SLA.0b013e3181ff461f

Original Paper URL
http://journals.lww.com/annalsofsurgery/Abstract/2011/01000/Meta_analysis_of_the_Effectiveness_of_Surgical.3.aspx

Indexing Status
Subject indexing assigned by NLM

MeSH
Abdominal Wall /surgery; Cryosurgery /instrumentation; Dermatologic Surgical Procedures; Diathermy; Humans; Postoperative Complications

AccessionNumber
12011001397

Date bibliographic record published
21/09/2011

Date abstract record published
28/05/2012

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.