Sutures versus staples for skin closure in orthopaedic surgery: meta-analysis

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CRD summary
The authors concluded that after orthopaedic surgery, there was a significantly higher risk of developing wound infection when the wound was closed with staples rather than sutures. The authors' conclusions reflected the evidence presented, but they were based on a small number of mainly poor-quality trials. These conclusions should therefore be interpreted with caution.

Authors' objectives
To compare the clinical outcomes of staples versus sutures in wound closure after orthopaedic surgery.

Searching
AMED, British Nursing Index, CINAHL, EMBASE, MEDLINE, Scopus, and the Cochrane Library were searched, without language restriction, up to July 2009. Search terms were reported. Unpublished material was searched for on SIGLE, NTIS, NRR, and Current Controlled Trials. Reference lists were searched and authors contacted to identify additional studies.

Study selection
Eligible for inclusion were randomised and non-randomised clinical trials, which compared the outcomes of wound closure with skin staples or sutures after any type of orthopaedic surgery. Studies of synthetic adhesives, such as 2-octyl cyanoacrylate, or ones that provided insufficient information on population characteristics, surgical procedures or outcomes, were excluded from the review.

The primary outcome of interest was the incidence of wound infection, after skin staples compared with suture closure, after orthopaedic surgery. Secondary outcomes included the incidence of wound opening, inflammation, discharge, necrosis, abscess formation, allergic reactions, length of stay, closure time, and patients' satisfaction and pain. Types of surgery included hip fracture surgery, total hip replacement, total knee replacement, and upper and lower limb trauma surgery. Time to removal of sutures ranged from 10 to 16 days. Where reported, the mean age of patients ranged from 75 years to 85 years. In the majority of studies routine antibiotics were administered.

Two reviewers independently selected studies for inclusion in the review.

Assessment of study quality
Two reviewers independently assessed study quality using the 11-item Physiotherapy Evidence Database (PEDro) scale. This scale assessed eligibility criteria, random allocation, allocation concealment, baseline comparability, blinding, follow-up, intention-to-treat analysis, between-group analysis, and point estimates and variability. It had a maximum score of 11 points. Any disagreements were resolved through discussion.

Data extraction
Data were extracted by two reviewers independently, into a predefined database, to calculate risk ratios (RRs), the mean difference, and their 95% confidence intervals (CIs).

Methods of synthesis
RRs were combined in a meta-analysis using both fixed-effect and random-effects models. A fixed-effect model was used when the statistical heterogeneity was less than 20%; otherwise a random-effects model was used. Statistical heterogeneity was assessed using the $X^2$ and $I^2$ tests. Publication bias was assessed using a funnel plot. Subgroup analyses were performed to compare the separate results of skin staples and sutures in hip, knee, spinal, and upper extremity procedures.

Results of the review
Six studies were included, with 683 patients. Only one study was deemed of high quality and it scored nine points on the PEDro scale. The remaining studies scored five, four, three, two, and one. The funnel plot did not show substantial evidence of publication bias. Follow-up ranged from 10 to 365 days.

**Orthopaedic procedures** (six studies): The risk of wound infection was statistically significantly greater for staples compared with sutures (RR 3.83, 95% CI 1.38 to 10.68). There were no statistically significant differences in relative risks of wound discharge (three studies), inflammation (two studies), necrosis (two studies), opening or splitting (four studies), and allergic reaction (two studies), between staples and sutures. There was statistically significant heterogeneity for wound inflammation ($I^2 = 85\%$) and discharge ($I^2 = 59\%$).

**Hip surgery** (four studies): The risk of wound infection was statistically significantly greater for staples compared with sutures (RR 4.79, 95% CI 1.24 to 18.47). There were no statistically significant differences in the risks of discharge (two studies), wound opening (three studies), and allergic reaction (two studies). There was statistically significant heterogeneity for wound discharge ($I^2 = 62\%$).

**Knee surgery** (two studies): There was no statistically difference in the risk of wound infection.

**Authors’ conclusions**
After orthopaedic surgery, there was a significantly higher risk of developing a wound infection when the wound was closed with staples rather than sutures. This risk was greater for patients who underwent hip surgery rather than other orthopaedic surgery.

**CRD commentary**
This review addressed a clear research question and was supported by adequate inclusion criteria. The search strategy included a number of databases and searches for unpublished studies, which reduces the risk of publication bias. The search was also conducted without language restriction, which reduces the risk of language bias. The validity tool was appropriate for the designs of the included studies. Synthesis methods were appropriate and varied according to the level of statistical heterogeneity. The review process was carried out with sufficient attempts to minimise reviewer error and bias.

The authors’ conclusions reflected the evidence presented, but they were based on a small number of mainly poor-quality trials. These conclusions should therefore be interpreted with caution.

**Implications of the review for practice and research**
**Practice:** The authors stated that orthopaedic surgeons should reconsider their use of staples for wound closure.

**Research:** The authors stated that further well-designed randomised controlled trials were required to confirm the findings of the meta-analysis and that these trials should use concealed randomisation.

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