CRD summary
The authors stated that wound drains following routine thyroid surgery had no effect on reoperation rates, but could increase infection rates, length of stay and postoperative pain, with no effect on other complications. Despite some concerns about trial quality, this conclusion generally reflects the evidence presented and seems reliable.

Authors' objectives
To evaluate the effectiveness of wound drains for thyroid and parathyroid surgery.

Searching
MEDLINE, EMBASE, The Cochrane Library, CINAHL, and trial registries were searched up to April 2013 for published or unpublished studies. Reference lists were screened to identify other relevant studies. Some search terms were reported. No language restrictions were applied.

Study selection
Randomised controlled trials comparing any form of postoperative drainage (open, passive or suction) versus no drainage were considered. Trials of patients who underwent any thyroid or parathyroid surgery, irrespective of their indication or age, were included; those of patients undergoing lateral neck dissections were excluded.

Nearly all the included trials compared a suction drain versus no drain; two compared an open drain versus no drain. Half of the trials excluded patients with large goitres or goitres with substernal extension. Parathyroid operations, without thyroid surgery, were included in a few trials (three). None of the patients underwent minimally invasive parathyroidectomy. The outcomes were reoperation for neck haematoma (primary outcome), wound infection, ultrasound-assessed fluid volume, wound collection, transient voice change, persistent recurrent laryngeal nerve palsy, length of hospital stay, pain, and deaths. Trials were conducted in a range of countries; one was in the UK. No other patient characteristics were reported.

Trials were selected by two reviewers independently.

Assessment of study quality
Two reviewers assessed the quality of the trials, independently, using the Cochrane risk of bias tool. Disagreements were resolved with a third reviewer. Quality was classified as high, reasonable or poor.

Data extraction
The outcome data were extracted to calculate risk ratios and mean differences, with 95% confidence intervals. Attempts were made to contact trial authors where data were missing.

The data were extracted by two reviewers independently.

Methods of synthesis
Where data were available from four or more trials, they were combined in a meta-analysis to calculate a pooled risk ratio or mean difference. Heterogeneity was assessed using I². If this was below 50%, a fixed-effect model was used, otherwise, a random-effects model was used.

For all outcomes, sensitivity analyses were conducted by including only high-quality trials, and only trials in which resection of large goitres was not undertaken. Where sufficient data were available, additional sensitivity analyses were conducted, by including trials that specifically excluded coagulopathy; those that specifically excluded patients who had undergone previous neck surgery or irradiation; those in which open drains were not used; and those that excluded patients undergoing parathyroid surgery. Publication bias was assessed using a funnel plot.

Results of the review
Twenty-five trials were included (2,939 patients; range 55 to 400). Twelve trials were high quality, and all others were reasonable. There were several gaps in trial reporting – 10 trials did not report randomisation methods, eight did not report allocation concealment methods, and only one reported blinding of outcome assessors. All trials were considered to have appropriate length of follow-up and used intention-to-treat analyses.

The hospital stay was significantly longer in the drain group (MD 1.25 days, 95% CI 0.83 to 1.68; 18 trials). The wound infection rate was significantly higher (RR 2.53, 95% CI 1.23 to 5.21; 11 trials), as was the pain score, using a visual analogue scale from 1 to 10, on day one after surgery (MD 1.46, 95% CI 0.67 to 2.26; six trials).

There were no statistically significant differences between drainage and no drainage in the rate of reoperation for neck haematoma (10 trials), ultrasound-assessed fluid volume on day one after surgery (six trials), wound collection requiring intervention (10 trials), or not (17 trials), transient voice change (five trials), and persistent recurrent laryngeal nerve palsy (two trials). No trial reported any deaths.

There was evidence of substantial heterogeneity for pain scores ($I^2=97\%$), length of hospital stay ($I^2=99\%$), and ultrasound-assessed fluid volume on day one ($I^2=93\%$). No evidence of heterogeneity was found for the other outcomes. In the sensitivity analyses, the statistical significance remained unchanged for nearly all outcomes. The authors did not find evidence of publication bias.

**Authors' conclusions**

This review indicated that wound drains following routine thyroid surgery had no effect on reoperation rates, but could increase infection rates, length of stay and postoperative pain, with no effect on other complications.

**CRD commentary**

The review question and selection criteria were clearly reported. The searches included a range of bibliographic sources. Unpublished trials were sought, and there were no restrictions on language. Attempts were made to minimise the risk of reviewer error and bias at all stages of the review.

The methods of analysis were well reported. Most trials were small, and the event rates were low in some, so some analyses may not have been sufficiently powered, as shown by the wide confidence intervals for several outcomes. Heterogeneity was substantial for several outcomes. None of the trials was considered to be poor quality, despite many gaps in their reporting.

This was a largely well-conducted review and the results of the sensitivity analyses suggest that the findings were generally robust. On this basis, the authors' conclusions seem reliable.

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

**Practice:** The authors stated that the results of the review provided no evidence to advocate the use of drains in routine thyroid surgery to decrease the risk of reoperation for neck haematoma.

**Research:** The authors stated no implications for further research.

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