A meta-analysis of surgical morbidity and recurrence after laparoscopic and open repair of primary unilateral inguinal hernia

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CRD summary
This review compared open and laparoscopic (keyhole) surgery for repair of groin hernias. The authors concluded that totally extraperitoneal laparoscopic repair was associated with an increased risk of hernia recurrence but transabdominal preperitoneal repair was not. These conclusions reflect the evidence presented but the very different follow-up times across trials make their reliability uncertain.

Authors' objectives
To compare laparoscopic and open repair of primary unilateral inguinal hernia.

Searching
The authors searched MEDLINE, EMBASE and Cochrane Central Register of Controlled Trials (CENTRAL) to March 2011 using a limited number of search terms (reported in the paper). Reference lists of retrieved papers were screened for additional publications. The search was restricted to publications in English.

Study selection
Randomised controlled trials (RCTs) that directly compared open and laparoscopic repair were eligible. The primary outcome was hernia recurrence. Secondary outcomes were perioperative complications and long-term (beyond one month) postoperative morbidity. Trials in children and in people with bilateral or recurrent hernias were excluded.

Included studies enrolled patients between 1992 and 2004. Mean age of participants, where reported, ranged from 35.6 to 65.5 years. About one-third of trials involved multiple centres. Laparoscopic hernia experience, where reported, ranged from five to 200. Various techniques were used for both open and laparoscopic repair: primarily Lichtenstein for open repair and transabdominal preperitoneal (TAPP) or totally extraperitoneal (TEP) for laparoscopic.

Two reviewers independently selected studies for the review; disagreements were resolved by discussion.

Assessment of study quality
Study quality was assessed using the Jadad scale to assign a score between 0 and 5.

The authors did not state how many reviewers assessed quality.

Data extraction
Data on numbers of participants and events in each group were used to calculate relative risks (RRs) and 95% confidence intervals (CIs) for each outcome at the longest available follow-up. Corresponding authors were contacted to clarify incomplete or unclear data.

The review authors did not state how many reviewers were involved in data extraction.

Methods of synthesis
Pooled relative risks were calculated by meta-analysis using a random-effects (DerSimonian and Laird) model. Statistical heterogeneity was assessed using the $I^2$ and Cochran's $Q$ statistics. Subgroup analyses compared open repair with two different types of laparoscopic repair (transabdominal preperitoneal and totally extraperitoneal).

Results of the review
Twenty-seven RCTs with 8,751 randomised participants (range 50 to 1,537) were included. Quality scores on the Jadad scale ranged from 1 to 5 (median 3). Twelve trials reported a power calculation, 20 described the method of randomisation and 15 described withdrawals in detail. Follow-up ranged from 0.5 to 70 months.

Hernia recurrence: Laparoscopic repair was associated with a statistically significant doubling of the risk of recurrence
compared with open repair (RR 2.06, 95% CI 1.26 to 3.37; 18 RCTs). Substantial heterogeneity was present ($I^2=50.9\%$). In subgroup analyses, totally extraperitoneal repair was associated with an increased risk of recurrence compared with open repair (RR 3.82, 95% CI 1.66 to 8.35; 10 RCTs; $I^2=38.2\%$). There was no statistically significant difference between transabdominal preperitoneal repair and open repair (RR 1.14, 95% CI 0.78 to 1.68; 11 RCTs; $I^2=0\%$).

**Perioperative morbidity:** Laparoscopic repair was associated with a statistically significant 22% increase in the risk of perioperative morbidity compared with open repair (RR 1.22, 95% CI 1.04 to 1.42; 18 RCTs; $I^2=0\%$). In subgroup analyses, transabdominal preperitoneal repair was associated with an increased risk compared with open repair (RR 1.47, 95% CI 1.18 to 1.84; 13 RCTs; $I^2=0\%$) but totally extraperitoneal repair was not (RR 1.05, 95% CI 0.85 to 1.30; eight RCTs; $I^2=0\%$).

**Postoperative complications:** Laparoscopic repair was associated with statistically significant reductions in risk of both chronic groin pain (RR 0.66, 95% CI 0.51 to 0.87; 13 RCTs; $I^2=27.7\%$) and chronic numbness (RR 0.27, 95% CI 0.12 to 0.58; eight RCTs; $I^2=28\%$) compared with open repair. Results of subgroup analyses were reported.

**Authors’ conclusions**
Totally extraperitoneal repair was associated with an increased risk of recurrence relative to open repair but transabdominal preperitoneal repair was not. Transabdominal preperitoneal repair carried an increased risk of perioperative complications compared with open repair. Laparoscopic repair reduced risks of chronic pain and numbness compared with open repair.

**CRD commentary**
The review question and inclusion criteria were clear. The search covered several relevant sources. The restriction to studies in English and the lack of any explicit attempt to search for unpublished trials meant that relevant trials may have been missed and publication bias could not be ruled out. Studies were selected by two independent reviewers, which minimised risks of errors and bias; it was unclear whether similar methods were used for data extraction and quality assessment. Study quality was assessed using a standard scale and some relevant details were reported.

The meta-analysis treated the primary outcome of recurrence as a dichotomous outcome rather than a time-to-event outcome. This meant that trials with very different lengths of follow-up were pooled and this could have produced misleading results. Heterogeneity in the meta-analyses was explored mainly by subgroup analyses involving two different types of laparoscopic repair. This was a reasonable approach although it was unclear whether the subgroup analyses were specified in advance. The authors’ conclusions were largely derived from the subgroup analyses.

The authors’ conclusions reflect the evidence presented but it was not clear how the results of the trials might depend on the differing follow-up times, so the conclusions may not be reliable.

**Implications of the review for practice and research**
**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that further randomised trials were necessary to evaluate the efficacy of totally extraperitoneal repair before it can be recommended for repair of primary inguinal hernias.

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