Single-incision laparoscopy for colorectal resection: a systematic review and meta-analysis of more than a thousand procedures  
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CRD summary
The authors concluded single-incision laparoscopic colorectal surgery compared to multiport laparoscopic surgery was associated with a similar postoperative morbidity, shorter length of skin incision and shorter length of hospital stay. The reliability of the conclusion is uncertain given possible reviewer error and bias in study selection and quality assessment, and reliance on observational studies.

Authors' objectives
To assess the effectiveness and safety of colorectal resection performed through single-incision laparoscopy on intraoperative and postoperative outcomes.

Searching
MEDLINE and ClinicalTrial.gov were searched for studies published between October 2008 and December 2011. Search terms were reported. References of selected papers were handsearched. Only papers published in English were considered.

Study selection
Clinical studies or case reports which compared single-incision laparoscopic with multiport laparoscopy, and included at least one patient with a colonic or rectal resection performed through a single-incision laparoscopic approach were eligible for inclusion. Studies available in abstract form only were excluded. Outcome measures were: conversion to laparotomy, operation time, postoperative morbidity, length of skin incision and length of postoperative hospital stay.

Types of single-incision laparoscopic port devices were varied. Most procedures were for cancer (389 malignant cases and 295 benign cases). Colostomy sites were varied: right, left, and total; right and left; right; left. One hundred and five rectal procedures (50 malignant cases and 55 benign cases) were performed through a single-port laparoscopic approach (low anterior resection, total proctocolectomy, abdominoperineal resection).

The authors did not state how many reviewers assessed study eligibility for the review.

Assessment of study quality
Study quality was assessed using the Newcastle–Ottawa scale which measured quality of selection, comparability, exposure and outcome of study participants. The maximum score (which indicated high quality) was 9. The authors did not state how many reviewers assessed study quality.

Data extraction
Two reviewers independently extracted data needed to calculate odds ratios (for conversion to laparotomy and postoperative morbidity outcomes) and mean differences (for operation time, total length of skin incision and postoperative hospital stay outcomes) with 95% confidence intervals from comparative studies.

Methods of synthesis
Pooled odds ratios and weighted mean differences (with 95% confidence intervals) were calculated using random-effects (Mantel–Haenszel and inverse variance) meta-analysis. Statistical heterogeneity was assessed using $I^2$ and $X^2$.

Results of the review
Sixty four studies were included in the review: 15 retrospective comparative studies and 49 non-comparative studies. A total of 1,026 colorectal resections performed by single-incision laparoscopic were included in the studies. The quality of included studies was varied, and was reported to range between good to excellent.

Single-incision laparoscopic port devices
Most studies reported successful single-incision laparoscopic colorectal resection using standard laparoscopic ports placed through the same skin incision (64 participants) or a homemade single-incision laparoscopic port using a surgical glove (50 participants).

**Oncological results (49 studies, 536 colorectal procedures)**

Less than 12 lymph nodes were noted on the pathological specimen in 1% (4/536) of patients. One study reported a mean number of harvested lymph nodes of less than 12 (8.8 ± 6.6). The mean number of lymph nodes was 12 or more in the remaining studies.

Meta-analysis of results of the 15 comparative studies comprised a total of 1,075 procedures (494 single-incision and 581 multiport laparoscopies).

There was no difference between single-incision laparoscopic surgery and multiport approach on: conversion to open laparotomy (OR 0.58, 95% CI 0.24 to 1.38; I²=0%); postoperative morbidity (OR 0.84, 95 CI 0.61 to 1.15; I²=0%) or operation time (WMD -0.27, 95% CI -6.50 to 5.95; I²=26%).

Single-incision laparoscopic surgery was associated with shorter total skin incision (WMD -0.52, 95% CI -0.79 to -0.25; I²=40%) and postoperative length of hospital stay (WMD -0.75, 95% CI -1.30 to -0.20; I²=85%).

**Authors’ conclusions**

Single-incision laparoscopic colorectal surgery compared to multiport laparoscopic surgery was associated with a similar postoperative morbidity, shorter length of skin incision and shorter length of hospital stay.

**CRD commentary**

The review question was clearly stated and inclusion criteria were potentially replicable. Only one major database was searched so several relevant papers could have been missed. Data abstraction was carried out in duplicate, which minimised potential error and bias. It was unclear whether similar procedures were used in study selection and quality assessment. Study quality was assessed using the Newcastle-Ottawa scale and reported to range between good to excellent. Methods used to combine study results appeared appropriate. The presented evidence was mainly derived from observational studies; no randomised controlled trial was included.

The reliability of the authors’ conclusion is uncertain given possible reviewer error and bias in study selection and quality assessment, and reliance on observational studies.

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

**Practice:** The authors stated that single-incision laparoscopy could not at present be recommended for malignancy in routine clinical practice given the retrospective nature and limited number of patients assessed in the available studies.

**Research:** The authors stated that further randomised controlled trials were needed to assess the net benefit (risk / benefit balance) of single-incision laparoscopy on postoperative morbidity and long-term postoperative outcomes. They further noted that at least four prospective studies were on-going, including one randomised controlled trial of single-incision laparoscopy versus conventional laparoscopic colectomy for colon cancer.

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