



Single-incision laparoscopy versus standard laparoscopy for colorectal surgery: A systematic review and meta-analysis



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ARTICLE INFO

Article history:

Received 30 May 2016

Received in revised form

23 February 2017

Accepted 8 March 2017

Keywords:

Single-incision laparoscopic surgery

Laparoscopy

Single-incision

Single-port surgery

Colorectal surgery

Colectomy

Systematic review

Meta-analysis

ABSTRACT

The aim of this meta-analysis was to evaluate if the advantages of single-incision laparoscopic surgery (SILS) to perform a colorectal resection justify a broad application of this approach. A total of 32 studies including 3863 patients, comparing colorectal procedures performed with SILS or multi-port laparoscopy (LCS) were analyzed after a systematic review. Colorectal SILS had comparable outcomes to multi-port LCS in terms of operating time ($P = 0.44$), conversion rate (2.0% vs 3.0%; $P = 0.52$), reoperations (1.1% vs 1.7%; $P = 0.26$), postoperative complications (14.4% vs 13.6%; $P = 0.10$) and mortality (0.24% vs 0.68%; $P = 0.46$). Mean hospital stay was significantly shorter in CSILS group, (MD = -0.88 [$-1.33, -0.42$], 95% CI, $P = 0.0001$), but heterogeneity was found ($I^2 = 65\%$; $P < 0.0001$). The oncological results of SILS for colorectal cancer were satisfactory, as demonstrated by similar average lymph node retrieval ($P = 0.72$) and adequate resection margins (negative in all cases) compared to those obtained with LCS. Nevertheless, there are currently no available long-term follow-up data comparing the survival rates and local recurrence between both approaches. Insufficient data were available for evaluating long-term incisional hernia rates, and other potential benefits associated with colorectal SILS (cosmesis, postoperative pain) remain to be objectively proved. To date there is insufficient evidence to recommend widespread use of SILS instead of LCS for colorectal surgery.

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1. Introduction

Laparoscopic surgery is a safe and effective approach for colonic diseases (LCS), as confirmed by many prospective randomized studies on laparoscopic surgery that have shown that it results in a lower level of blood loss, a better recovery with lower postoperative pain, a shorter length of hospital stay, and equal oncological results when compared to open colectomy.^{1–7} The many advantages of LCS therefore warrant its consideration as the gold standard approach for performing a colonic resection.

In recent years, the search for methods to improve the short-term outcomes of multi-port laparoscopic surgery has led surgeons to newer means of access to the abdominal cavity with less surgical trauma, such as mini-laparoscopic surgery, natural orifice transluminal endoscopic surgery (NOTES) and single-incision laparoscopic surgery (SILS).^{8–10}

Due to the obvious complexity of NOTES, SILS appears to be a very attractive technique for surgeons aiming to improve laparoscopic procedures. The rationale for the SILS approach includes not only reducing morbidity related to accessory trocars (less trauma to the abdominal wall) but also the other potential benefits of SILS over multi-port laparoscopic surgery: greater patient comfort, less postoperative pain, and a better cosmetic result due to a scarless procedure. To date, a wide range of operations has been performed by the SILS approach with good results: appendectomy, cholecystectomy, splenectomy, bariatric procedures, etc., and, of course, colonic resections.^{11–19}

In spite of the favorable literature, the true benefits of SILS over conventional laparoscopic surgery remain undefined, as there are no definitive clinical data supporting them.^{9,10,20} In addition, SILS requires a learning curve, adequate technology, and a longer operating time due to the limited movements of the team while the operative field is exposed.^{17,21,22} This is especially the case while performing colonic resections (without additional trocars), which often required operating in different abdominal quadrants and the creation of a tension-free anastomosis. As such, some surgeons still question whether it is possible for SILS to offer tangible benefits in

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comparison with multi-port laparoscopic surgery when performing a colonic resection.

2. Objective

The aim of this article is to review the published literature and to evaluate the outcomes and potential advantages of SILS when performing a colorectal resection (CSILS), as compared to conventional multi-port laparoscopic colorectal surgery (LCS).

3. Materials and methods

This study was performed according to the recommendations of the Preferred Reporting Items for Systematic Review and Meta-Analysis Statement (PRISMA).²³ We searched the electronic databases, PubMed, MEDLINE, and the Cochrane Central Register of Controlled Trials in January 2016. The search terms were “single incision”, “single port”, “SILS”, “LESS”, “laparoscopy”, “colon”, “colectomy” and “laparoscopic surgery”. Only randomized clinical trials (RCT), case-matched controlled studies or observational studies comparing colorectal SILS (only pure single-incision laparoscopic surgery) with LCS were included (Fig. 1). The decision about the inclusion of non-randomized studies in this meta-analysis was taken to overcome the problems associated to the paucity of randomized evidence. Reports of small case-series and abstracts of presentations at meetings and congresses were excluded. Institutions or Units that published more than one report were only included once in order to avoid the duplication of information. Two reviewers read all titles and abstracts of the studies that met the initial criteria. The selected studies were then thoroughly reviewed independently, collecting the relevant data. If the

reviewers disagreed about the conditions of a study or about the extracted data, the conflict was solved by a third reviewer.

The *primary outcomes* of this systematic review and meta-analysis were mortality and the 30-day postoperative complication rates of both techniques (anastomotic leak and abdominal abscess, hemorrhage, wound infection, etc.) in order to evaluate the feasibility and safety of CSILS.

The *secondary outcomes* were operating time, conversion rate, reoperations, length of hospital stay, oncological parameters (lymph node harvest and resection margins), pain reduction, cosmetic results and long-term incisional hernia rate.

3.1. Statistical analysis

To analyze continuous variables, such as the operating time or the hospital stay, the mean differences (MDs) and the inverse variance method were used. Standard deviation (SD) was not available in some cases; the original means and ranges extracted from the studies were converted to means and standard deviation (SD) using the method described by Hozo.²⁴ Data about categorical variables were pooled and the odds ratio (OR) were calculated. The Mantel-Haenszel method was used to calculate the weighted summary OR. The heterogeneities of the pooled effects were evaluated with the I^2 statistic (more than 25% was regarded as indicative of the presence of heterogeneity). The confidence interval (CI) was established at 95%, and P value of <0.05 was considered to be statistically significant. A fixed effects model was used when no significant heterogeneity existed among studies ($P > 0.05$, $I^2 < 50\%$), and when $P < 0.05$ and $I^2 > 50\%$, a random effects model was applied. We must bear in mind that the absence of statistical heterogeneity does not guarantee that the studies are completely

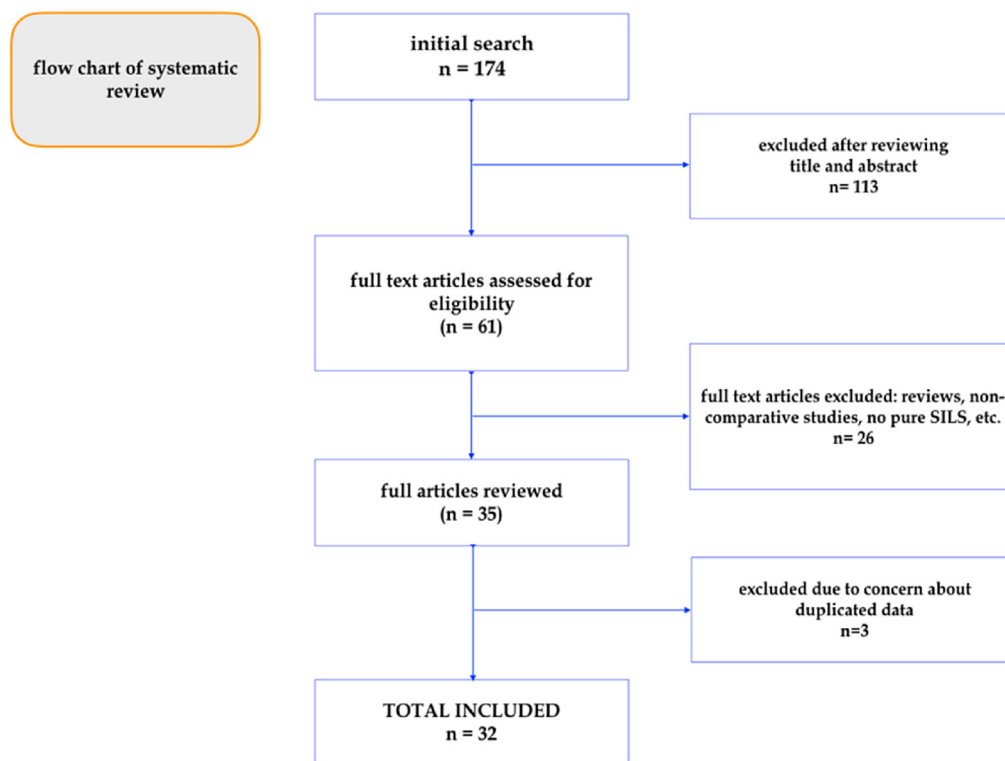


Fig. 1. Flow chart showing the selection process for the review.

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