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SINGLE-INCISION LAPAROSCOPY VERSUS STANDARD LAPAROSCOPY FOR COLORECTAL SURGERY: A SYSTEMATIC REVIEW

Sulistyo Negoro Tommy Antariksa*

**Indonesian Navy Hospital dr. R. Oetojo, Sorong, Southwest Papua, Indonesia. Email: drsnta@gmail.com*

Corresponding Author:
drsnta@gmail.com

Abstract

Background: *Colorectal cancer (CRC) is the third most prevalent malignancy worldwide. Only surgical resection is curative for colorectal cancer. Recent advances in surgical techniques, such as robot-assisted laparoscopic surgery (RALS), single-incision laparoscopic surgery (SILS), and natural orifice transluminal endoscopic surgery (NOTES), etc., have benefited colorectal cancer patients tremendously.*

The aim: *This study aims to compare single-incision laparoscopy and conventional laparoscopy for colorectal surgery.*

Methods: *By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2013 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

Result: *In the PubMed database, the results of our search brought up 201 articles, whereas the results of our search on SagePub brought up 119 articles. The results of the search conducted for the last year of 2013 yielded a total 54 articles for PubMed and 23 articles for SagePub. In the end, we compiled a total of 16 papers, 11 of which came from PubMed and 5 of which came from SagePub. We included six research that met the criteria.* ***Conclusion:*** *Previous studies have consistently shown that complications within 30 days postoperatively and incision size in patients with single port are better than patients with multiport. Perioperative outcome and long-term survival rates were similar between the two groups.*

Keyword: *Colorectal cancer; Colorectal surgery; Laparoscopy;*

INTRODUCTION

About 1.4 million new cases of colorectal cancer (CRC) are diagnosed each year. This makes it the third most common type of cancer. It is the third most common cancer in men (746,000 cases, 10.0% of total) and the second most common cancer in women (614,000 cases, 9.2% of total) worldwide; it is the fourth top cause of cancer death worldwide, with nearly 700,000 deaths in 2012. Different parts of the world have different rates of colon cancer. Europe has the highest rate, followed by North America, Oceania, Latin America, and Africa.[1–3]

However, the course of colorectal cancer seems to vary depending on a country's Human Development Index (HDI), which appears to have a correlation to changes in food consumption, attitudes towards smoking, activity patterns, and screening programmes. The incidence rate is on the decline in North America, Oceania, and Europe, particularly in the United States, New Zealand, and France, but it is on the rise in South America, Asia, and Eastern Europe. In particular, the United States, New Zealand, and France.[4] In the past 60 years, minimally invasive surgery techniques have revolutionised general surgery to improve the recovery rate.[5]

Tumour resection is the "gold standard" for the treatment of CRC. Many prospective randomised studies have shown that laparoscopic surgery for colonic diseases (LCS) is safe and effective, with less blood loss, less postoperative pain, a shorter hospital stay, and equal oncological results compared to open colectomy.[5,6] The traditional open method of surgery was replaced with the more modern laparoscopic method, which brought with it a number of major benefits. The length of the operation, the amount of postoperative pain, and the amount of time it takes to recover could all be shortened by minimising the size of the scar. The cosmetic outcome following surgery is another area that has room for improvement.[7–9]

In the field of minimally invasive surgical procedures for colorectal cancer, SILS is viewed as an alternate surgical technique to NOTES and as the next big advance in the field overall. When compared with conventional laparoscopic surgery (CLS), singleincision laparoscopic surgery (SILS) is thought to have a number of benefits, including less postoperative pain, a better cosmetic effect, fewer postoperative complications, less intraoperative blood loss, a shorter hospital stay, and a shorter length of skin incision, amongst others. This is because the surgeon only needs to make one incision to perform the procedure.[10,11]

This study aims to compare single-incision laparoscopy and conventional laparoscopy for colorectal surgery.

METHODS Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

In this literature review, we investigate single-incision laparoscopy versus standard laparoscopy for colorectal surgery. This may be performed by reviewing or examining the prior research that has been done on the subject. The relevance of the challenges that have been highlighted will be demonstrated throughout this paper as its primary objective.

The following requirements were met by researchers in order for them to participate in the study: 1) The paper needs to be written in English and should discover single-incision laparoscopy versus standard laparoscopy for colorectal surgery in order for it to be considered for publication. 2) The analysed literature includes publications that were published after 2013 but before the time period that this systematic review considers. Editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are virtually similar to already published journal papers are examples of types of research that are not allowed.

Search Strategy

We used "single-incision laparoscopy"; "versus"; "standard laparoscopy"; and"colorectal surgery" as keywords.The search for studies to be included in the systematic review was carried out from July, 9th 2023 using the PubMed and SagePub databases by inputting the words: *(("single person"[MeSH Terms] OR ("single"[All Fields] AND "person"[All Fields]) OR "single person"[All Fields] OR "single"[All Fields] OR "singles"[All Fields]) AND ("incise"[All Fields] OR "incised"[All Fields] OR "incises"[All Fields] OR "incising"[All Fields] OR "incision s"[All Fields] OR "incisions"[All Fields] OR "surgical wound"[MeSH Terms] OR ("surgical"[All Fields] AND "wound"[All Fields]) OR "surgical wound"[All Fields] OR "incision"[All Fields]) AND ("laparoscopie"[All Fields] OR "laparoscopy"[MeSH Terms] OR "laparoscopy"[All Fields] OR "laparoscopies"[All Fields]) AND ("versu"[All Fields] OR "versus"[All Fields]) AND ("reference standards"[MeSH Terms] OR ("reference"[All Fields] AND "standards"[All Fields]) OR "reference standards"[All Fields] OR "standardization"[All Fields] OR "standard"[All Fields] OR "standard s"[All Fields] OR "standardisation"[All Fields] OR "standardisations"[All Fields] OR "standardise"[All Fields] OR "standardised"[All Fields] OR "standardises"[All Fields] OR "standardising"[All Fields] OR "standardization s"[All Fields] OR "standardizations"[All Fields] OR "standardize"[All Fields] OR "standardized"[All Fields] OR "standardizes"[All Fields] OR "standardizing"[All Fields] OR "standards"[MeSH Subheading] OR "standards"[All Fields]) AND ("laparoscopes"[MeSH Terms] OR "laparoscopes"[All Fields] OR "laparoscope"[All Fields] OR "laparoscopical"[All*

Fields] OR "laparoscopically"[All Fields] OR "laparoscopics"[All Fields] OR "laparoscopy"[MeSH Terms] OR "laparoscopy"[All Fields] OR "laparoscopic"[All Fields]) AND ("colorectal surgery"[MeSH Terms] OR ("colorectal"[All Fields] AND "surgery"[All Fields]) OR "colorectal surgery"[All Fields])) AND ((y_10[Filter]) AND (clinicaltrial[Filter])) used in searching the literature.

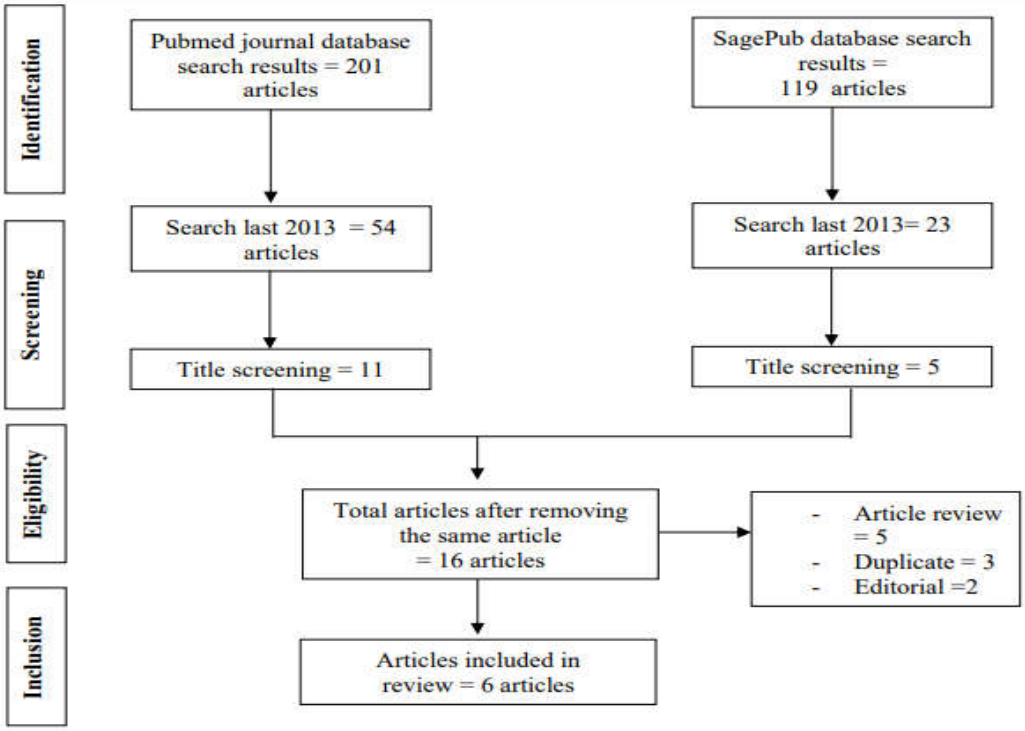

Figure 1. Article search flowchart

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 201 articles, whereas the results of our search on SagePub brought up 119 articles. The results of the search conducted for the last year of 2013 yielded a total 54 articles for PubMed and 23 articles for SagePub. In the end, we compiled a total of 16 papers, 11 of which came from PubMed and 5 of which came from SagePub. We included six research that met the criteria.

Lee, et al (2021)[12] showed 92,5% from 388 patients completed the investigation (SPLS, n = 179; MPLS, n = 180). The 30-day postoperative complication rate was 10.6% in the SPLS group and 13.9% in the MPLS group (interval of 95% confidence, -10.05 to 3.05 percentage points; P <0.01). Total incision length was shorter in the SPLS group than in the MPLS group (4.6 cm vs 7.2 cm, P <0.01), whereas there was no difference in the length of the specimen extraction site

(4.4 cm vs 4.6 cm, P = 0.249). There were no statistically significant differences between groups for any secondary or other outcomes.

Hirano, et al (2019)[10] showed patients with stage I had a relapse-free survival rate of 61.6%, whereas those who were diagnosed with stage II had a rate of 95.8%. The 5year overall survival rates for stage I, II and III patients were 97.4%, 85.3% and 72.9%, respectively. Patients who were classified pathologically as having T1, T2, T3, or T4 had cancer-specific survival rates of 100 percent, 100 percent, 92.1%, and 73.9% after five years, respectively. Single-site laparoscopic colectomy can be applied to the treatment of colon cancer with good long-term oncological outcomes. However, we should pay more attention when we treat the pathologically diagnosed T4 tumours.

Table 1. The litelature include in this study

Author	Origin	Method	Sample Size	Result
Lee, 2021[12]	Republic of Korea	Randomized ontrolled trial	388 patients	Even though there was no clear advantage to using single-port laparoscopic surgery (SPLS) over multiport laparoscopic surgery (MPLS) when doing a colectomy for cancer, our findings imply that SPLS is noninferior to MPLS and can be considered an alternative in certain patients, provided that it is performed by experienced surgeons. This is the case even though there was no obvious benefit to using SPLS over MPLS when performing a colectomy.
Hirano, 2019[10]	Japan	Comparative study	288 patients	Single-site laparoscopic colectomy can be applied to the treatment of colon cancer with good long-term oncological outcomes. However, we should pay more attention when we treat the pathologically diagnosed T4 tumours.
Miyo, 2017[13]	Japan	Retrospective study	971 patients	Acceptable perioperative results and oncological outcomes were achieved with single-site laparoscopic colectomy with complete mesocolic excision for the treatment of colon cancer. These
				outcomes were comparable to those that were achieved with conventional multiport laparoscopic colectomy.
Kang, 2017[14]	Republic of Korea	Randomized controlled trial	62 patients	Single-port laparoscopic surgery (SPLS) is a viable treatment option for colon cancer, and it can be carried out by adhering to oncologic principles.
Watanabe, 2016[15]	Japan	Randomized controlled trial	200 patients	There is no clear advantage to using single-incision laparoscopic colectomy (SILC) over multiport laparoscopic colectomy (MPLC).
Bulut, 2015[16]	Denmark	Randomized controlled trial	40 patients	Single-port rectal surgery may alleviate postoperative discomfort. Despite the fact that CRP levels were lower at some time intervals, the present randomised pilot study suggests that the trauma-induced inflammatory response of single-port operations may be comparable to that of conventional laparoscopic surgery.

Miyo, et al (2017)[13] showed the single-site laparoscopic colectomy group had more women, right-sided tumours, and early-stage tumours than the standard multiport group. After matching, both groups had 200 patients with similar characteristics. Median follow-up was 41.4 months. Both groups had similar intraoperative morbidity (p = 0.22) and postoperative problems (p = 0.87). Single-site and traditional, multiport laparoscopic colectomy groups had 95.5% and 91.3% disease-free and overall survival, respectively. Both groups had similar 3-year disease-free and overall survival rates in each stage.

Kang, et al (2017)[14] conducted a study with 62 patients. Only three patients in the SPLS group had problems during surgery, and they were all in the SPLS group. Six (19.4%) of the SPLS group patients had to switch to CLS or open

surgery. Both the number of lymph nodes removed and the length of the proximal and distal resection borders were the same between the two groups. Both groups had similar problems after surgery and similar recoveries of gut function, but one person in the SPLS group died from a problem after surgery. In all areas of QOL, the two groups were the same until 12 months after surgery.

Watanabe, et al (2016)[15] showed Surgical outcomes were similar between the MPLC and SILC arms, including duration of operation (mean = 162 versus 156 min; P = 0.273), blood loss (mean = 8.8 versus 21.4 ml; P = 0.102), conversion to open laparotomy (2.0 versus 1.0%; P = 0.561), reoperation (3.0 versus 3.0 per cent; P = 1.000), time to first flatus (both median 1 day; P = 0.155) and postoperative hospital stay (both median 6; P = 0.372). SILC had a reduced overall skin incision length (4.4 cm vs. 6.8 cm in MPLC; P <0.001). Analgesia use was 5 days in MPLC and 4 days in SILC (P = 0.485). Complication rates were comparable (15.0 versus 12.0%; P = 0.680).

Bulut, et al (2015)[16] showed the single-port group had lower coughing and mobilisation pain levels on surgical days 2, 3, and 4. The single-port group also had decreased resting pain at 6 h and on postoperative days 1, 3, and 4. The three markers increased dramatically after surgery. Plasma IL-6 and TIMP-1 increased similarly between groups at all time periods, whereas the single-port group had significantly lower CRP levels at 6 ($p < 0.001$) and 24 h ($p < 0.05$) following skin incision. Single-port abdominal incisions were shorter ($p = 0.001$). Operating time, blood loss, morbidity, and mortality were similar between groups. Both groups had similar short-term oncological outcomes.

DISCUSSION

The traditional open method of surgery was replaced with the more modern laparoscopic method, which brought with it a number of major benefits. The length of the operation, the amount of postoperative pain, and the amount of time it takes to recover could all be shortened by minimising the size of the scar. The cosmetic outcome following surgery is another area that has room for improvement. SILS is a relatively new minimally invasive method that is garnering a lot of interest from both patients and surgeons due to the potential benefits it offers. These benefits include a shorter incision length, a decreased rate of intraoperative problems, and a number of other benefits.[17]

The European Association of Endoscopic Surgery (EAES), following an analysis of various clinical controlled trials, came to the conclusion that SILS also has the advantages of improved aesthetics and decreased postoperative pain.[17]Although it has numerous advantages, single-incision laparoscopic surgery still has several limitations. This is despite the fact that high-quality visualisation has made it possible. The most significant factors contributing to the slow pace at which this technology has been embraced are its poor ergonomics and its difficulties to implement. When compared to CLS, SILS does not appear to have any evident advantages; in fact, the operation takes far more time and is significantly more complicated.[18]

The single-port technique may have potential benefits, such as less postoperative discomfort, fewer instances of wound infection, a more expedient recovery, and improved cosmesis. A widespread use was hindered since it required specialised tools, presented a new learning curve, and required a longer amount of time to operate. In 2008, the first single-port laparoscopic colectomy was published. The subsequent reports were predominantly single-center publications lacking randomization and long-term outcomes. All of these studies demonstrate that single-port laparoscopic colectomy is a feasible and safe alternative to conventional laparoscopic colectomy.[18,19]

Because the potential benefits of single-port laparoscopic surgery for rectal cancer (SPLRS), such as reducing the amount of surgical trauma and the number of woundrelated complications, are presumably separate, large-scale comparison studies will be required to determine whether or not there are any meaningful differences. The surgical community ought to organise randomised multicenter studies to identify both short-term and long-term outcomes, changes in quality of life, pain ratings, and evaluations of cosmetic results.[10,13,16]

Surgeons could be interested in the rate of patients who require a laparotomy after their initial procedure. There is a transition option available for SILS surgery, which is conversion to CLS. However, for CLS surgery, the procedure can only be changed directly to open surgery. Because of this, it is pointless to compare the rate of conversion to CLS between the two groups.[18] The definitions of conversion to CLS cannot be united throughout the research that we included in our review. In two studies, conversion to laparotomy was defined as the need for a skin incision longer than the prescribed incision to extract the resected specimen or to control intraoperative complications.[14,20]

CONCLUSION

Previous studies have consistently shown that complications within 30 days postoperatively and incision size in patients with single port are better than patients with multiport. Perioperative outcome and long-term survival rates were similar between the two groups.

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