

Research Article

A comparative study between single incision laparoscopic appendectomy and conventional laparoscopic appendectomy

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ABSTRACT

Background: Until recently transumbilical single incision laparoscopic appendectomy has been less popular in clinical practice than traditional laparoscopic appendectomy (LA). The goal of our study was to conduct a comparative analysis of the clinical outcomes for conventional laparoscopic appendectomy (CLA) and transumbilical single incision laparoscopic appendectomy (SILS).

Methods: This prospective study SILS versus CLA was carried out in the postgraduate department of surgery GMC Srinagar from February 2013 to October 2014 on patients suspected of having acute appendicitis. All patients were worked up and assessed according to a predefined protocol-detailed history, complete clinical examination, and laboratory parameters.

Results: The mean age of the patients in the SILS group was 23.9 years (16-35 years) and that in the CLA group was 25.3 years (16-35 years) ($p>0.05$). The mean operating time in the SILS group was 57.66 minutes and in the CLA group 52.83 minutes ($p>0.05$). The difference in the postoperative pain score of the two groups was not statistically significant ($p>0.05$). In our study cosmesis was assessed by using Manchester scar scale. The mean cosmesis scores were: 7th POD 6.0±0.587 (SILS) and 6.9±0.922 (CLA); 3 months postoperatively 5.73±0.691 (SILS) and 6.56±1.072 (CLA); 6 months postoperatively 5.33±0.606 (SILS) and 6.23±1.104 (CLA). The difference in mean cosmesis score between SILS and CLA was statistically significant ($p<0.05$).

Conclusions: Our comparative study between single incision laparoscopic appendectomy and conventional laparoscopic appendectomy shows that besides better cosmetic results in the former, there are no added advantages. However, SILS can be a safe and feasible alternative in young females who are cosmesis-conscious.

Keywords: Single incision laparoscopic appendectomy, Conventional laparoscopic appendectomy, Acute appendicitis

INTRODUCTION

The Vermiform Appendix has always been shrouded by controversies. The life time risk of acute appendicitis is 8.6% for males and 6.7% for females (male: female ratio is 1.4:1).¹ The application of the laparoscopic approach for acute appendicitis was first reported by Schreiber in

1987.² Since the days of Kurt Semm, much debate has centered on which technique is the preferable mode of removing the appendix. Proponents of laparoscopic appendectomy, however, claim that the advantages of the procedure include improved cosmetic results, improved wound healing, reduced postoperative pain, shorter hospital stays, and earlier return to normal activity. They

also support the idea of laproscopically evaluating the peritoneal cavity prior to committing to appendectomy, particularly in difficult cases.³⁻⁶

With the advent of minimal invasive surgery, the number of ports has been reduced to further improve cosmetic outcome.⁷⁻⁹ Single port laparoscopic appendectomy that requires only a single incision is becoming more popular. This surgical approach provides a number of advantages, including improved aesthetics (a single umbilical incision), lower risk of injury to abdominal muscle vessels, less postoperative pain and the possibility of converting to the conventional laparoscopic procedure (combined trocars) if necessary.^{10,11} Various methods have been reported, from a single incision at the right iliac fossa¹² to use of a single suprapubic incision that can be concealed in the pubic hair.¹³ Among these methods, a single incision at the umbilicus is virtually scarless. Since 1992, after the initial performance of a single-trocar appendectomy by Pelosi various studies evaluating transumbilical single incision laparoscopic appendectomies have been conducted.¹⁴⁻¹⁸ However, until recently transumbilical single incision laparoscopic appendectomy has been less popular in clinical practice than traditional laparoscopic appendectomy (LA). The goal of our study was to conduct a comparative analysis of the clinical outcomes for conventional laparoscopic appendectomy (CLA) and transumbilical single incision laparoscopic appendectomy (SILS).

METHODS

This prospective study SILS versus CLA was carried out in the postgraduate department of surgery GMC Srinagar, India, from February 2013 to October 2014 on patients suspected of having acute appendicitis.

All patients were worked up and assessed according to a predefined protocol-detailed history, complete clinical examination, laboratory parameters (CBC, KFT, LFT, CRP), urine examination, ECG, chest x-ray, USG abdomen and CT scan (if needed).

Inclusion criteria

Patients with Alvarado score of ≥ 7 ; patients with Alvarado score of 4-6 with evidence of appendicitis on high resolution USG; patient age ≥ 16 years and stable hemodynamic state.

Exclusion criteria

Patients suspected of complicated appendicitis; patients with history of cirrhosis or coagulation disorder; shock on admission; patients with previous open abdominal surgery; a large ventral hernia; severe cardiac or pulmonary disease; mental disability; pregnancy and patients refused to consent.

A total of 60 patients of acute appendicitis were included in this prospective study and were randomly distributed into two groups viz. SILS and CLA. An informed written consent was taken after explaining the procedure in detail.

RESULTS

The mean age of the patients in the SILS group was 23.9 years (16-35 years) and that in the CLA group was 25.3 years (16-35 years) ($p > 0.05$). Out of total of 21 males, 7 (33.33%) underwent SILS and out of 39 females, 23 (58.97%) underwent SILS. This difference however was not statistically significant ($p > 0.05$). Out of 28 patients coming from rural background, 10 (55.55%) underwent SILS and out of 32 patients from urban areas, 20 (62.5%) underwent SILS. This difference however was not statistically significant ($p > 0.05$). The difference in height and weight of patients in both the groups was not statistically different ($p > 0.05$).

Table 1: Comparison of the mean operative time of the two groups.

Operative time (in mins.)	Mean	SD	P- value*
SILS	57.66	7.62	0.4243
CLA	52.83	7.27	

SD= standard deviation, * Fishers exact test

The mean operating time in the SILS group was 57.66 min (45-70) and in the CLA group 52.83 min (40-65). This difference was not statistically significant ($p > 0.05$).

Table 2: Comparison of the postoperative pain scores in the two groups.

Visual analogue score (time in hours)	SILS (Mean $\pm$ SD)	CLA (Mean $\pm$ SD)	p-value*
At 1 hour	2.7 $\pm$ 0.749	2.5 $\pm$ 0.727	0.7402
At 12 hour	3.4 $\pm$ 0.498	3.2 $\pm$ 0.430	0.2668
At 24 hour	1.9 $\pm$ 0.999	2.0 $\pm$ 0.980	0.8812

*Fishers exact test

The difference in the postoperative pain score of the two groups was not statistically significant ($p > 0.05$). Mean number of intravenous doses of analgesic required was 1.4 in the SILS group and 1.2 in the CLA group. This difference was not statistically significant ($p > 0.05$).

The difference in duration of ileus in the two groups was not statistically significant (Table 3).

The difference between hospital stay and return to work in the two groups was not statistically significant ($p > 0.05$) (Table 4).

Table 3: Comparison of the duration of ileus in the two groups.

Return of bowel sounds	Mean (time in hours)	SD	P-value*
SILS	18.76	0.751	0.7306
CLA	19.05	0.758	

*Fishers exact test

Table 4: Comparison of the hospital stay and return to work in the two groups.

Parameter	SILS (mean±SD)	CLA (mean±SD)	P- value*
Hospital stay (days)	3.43 ± 0.404	3.53 ± 0.507	0.4536
Return to work (days)	3.53 ± 0.507	3.63 ± 0.490	0.600

*Fishers exact test

Table 5: Comparison of postoperative complications in the two groups.

Parameter	SILS	CLA	p- value*
Intra-abdominal abscess	0	0	1.000
Port site Infection	1	1	

*Fishers exact test

Port site infection was noted in 3.33% of patients in each group whereas none of our patients developed intra-abdominal collection. The difference was not statistically significant ($p>0.05$).

In our study cosmesis was assessed by using Manchester Scar Scale on 7th POD, 3 months postoperatively and 6 months postoperatively.

Table 6: Comparison of cosmetic results in the two groups.

Category	SILS Mean±SD	CLA Mean±SD	p-value*
7 th POD	6 ± 0.587	6.9 ± 0.922	0.00512
3 months	5.7 ± 0.691	6.5 ± 1.072	0.00569
6 months	5.3 ± 0.606	6.2 ± 1.043	0.00568

*Chi-square test

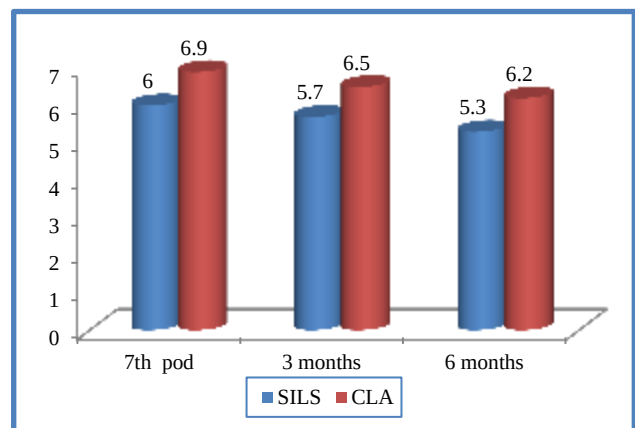
The difference between cosmetic results of the two groups was statistically significant ($p<0.05$) (Figure 1).

Figures 2 to 6 reveals various aspects of SILS from diagnosis to postoperative assessment.

DISCUSSION

Operative time

The entire operative time from the skin incision to the last stitch was measured in the minutes. The mean operating time in the SILS group was relatively more- 57.66 minutes (45-70) in SILS group; 52.83 minutes (40-65) in CLA group, though this difference was not statistically significant ($p>0.05$).

**Figure 1: Comparison of cosmetic results in the two groups.**

The relatively increased operative time in SILS can be accounted for by the initial learning curve due to crowding of instruments and chopstick effect i.e. criss-crossing of instruments while operating via the single transumbilical wound. However, we noted with time, when we were accustomed to the configuration and orientation of instruments, the operative time in SILS reduced substantially.

Similar reports were published by Lee JS et al¹⁹ with SILS requiring 58.9±18.7 minutes and CLA requiring 52.3±22.0.

Additional findings

Laparoscopy has the inherent advantage of inspecting whole of the abdominal cavity and thus looks for any concomitant or alternate pathology. Additional findings (concomitant or alternate pathology) were observed in 23.33% of patients undergoing SILS procedure and in 20% of patients undergoing CLA. This difference was not statistically significant ($p>0.05$).

The concomitant/alternate pathologies observed were managed accordingly.

Postoperative pain and analgesic requirement

Postoperative pain was assessed by 1 to 10 visual analogue scales. The pain scores were calculated at 1, 12 and 24 hours after surgery. The cumulative mean visual

analogue score at 1 hour was 2.7 in SILS group and 2.5 in CLA group; at 12 hour 3.4 in the SILS group and 3.2 in the CLA group; and at 24 hour 1.9 in the SILS group and 2.0 in the CLA group.



Figure 2: HR USG documenting acute appendicitis.

The pain scores in the SILS group at 1 and 12 hours after surgery was higher, probably because of vigorous manipulation while using wound retractor in umbilical wound so as to create adequate fasciotomies for trocar insertion. The difference in the postoperative pain score of the two groups was not statistically significant ($p>0.05$).



Figure 3: A transumbilical SILS incision marked before surgery.

Similar data were published by Lee JS et al¹⁹ who reported the mean pain scoring 24±3 hours after surgery as 2.63±1.3 in SILS group and 2.59±1.0 in CLA group ($p>0.05$).

Mean number of intravenous doses required was 1.4 in the SILS group and 1.2 in the CLA group and this difference in the analgesic requirement of the two groups was not statistically significant ($p>0.05$). Data published by Park JH et al²⁰ was in concordance with our study. In this study SILS group required 1.6 mean IV doses while CLA required 1.4 IV doses.



Figure 4: A photographic view of SILS using conventional laparoscopic instruments.



Figure 5: Intraoperative photograph showing division of mesoappendix using harmonic scalpel.

Duration of ileus

Postoperatively the patient's abdomen was auscultated for bowel sounds and mean duration of ileus was calculated as the time taken for return of normal bowel sounds. Mean duration of ileus was 18.76 hours in SILS group and 19.05 hours in CLA group; the difference was not statistically significant ($p>0.05$).

Park JH et al reported the mean duration of ileus to be 19.2 hours in SILS group and 20.8 hours in CLA group. The results published were reflected by our study.²⁰

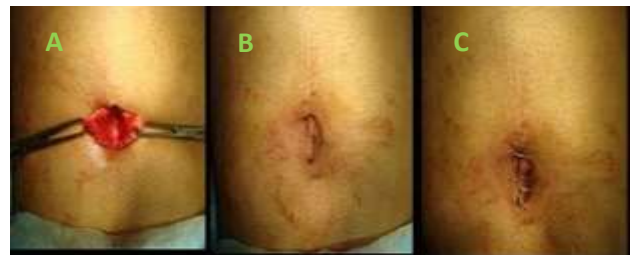


Figure 6: (A) Intraoperative picture of SILS; (B) & (C): Immediate postoperative pictures of SILS.



Figure 7: SILS pictures at 3 and 6 months follow up (A) and (B).



Figure 8: Another patient SILS picture at 6 months follow up.



Figure 9: Postoperative photograph of conventional laparoscopic appendectomy showing scars of 3 ports.

Intra-abdominal abscess and port site infection

None of our patients developed intra-abdominal collection. Port site infection was noted in 3.33% of patients in each group. The difference was not statistically significant ($p > 0.05$). Port site infection was managed by oral antibiotics and daily antiseptic dressings. Recovery from port site infection was uneventful.

Kang DB et al published data similar to our study and none of their patients developed intra-abdominal collection. Postoperative port site infection developed in 6.6% of patients in SILS group and 4.0 % of patients in CLA group.²¹

Hospital stay

Patients in the SILS group had mean operative stay of 3.4 days while it was 3.5 days in CLA group. The difference was not statistically significant ($p > 0.05$).

Park JH et al published data similar to our study wherein they reported a mean hospital stay of 3.6 days in SILS group and 3.9 days in CLA group.²⁰

Return to work

It was calculated in number of days, after discharge from hospital, when patient started mild to moderate activity. The mean duration of return to work was 3.5 days in SILS group and 3.6 days in CLA group; the difference was not statistically significant ($p > 0.05$).

Similar results were also published by Demibras S et al in which mean time for return to work (from the day of surgery) was 8.14 ± 2.5 days.²²

Cosmetic results and patient satisfaction

Scarring affects patients following trauma, burns, and surgical procedures. Several modalities have been devised to quantify scars for the purposes of determining response to treatment and for evaluating outcomes. Scar assessments can be objective or subjective. Objective assessments provide a quantitative measurement of the scar, whereas subjective assessments are observer dependent. Quantitative assessment of scars requires devices to measure their physical attributes. Subjective methods to assess scar provide a qualitative measurement of scar by a patient or clinician. Semi-quantitative methods to assess scars have been Scar scales devised to quantify scar appearance in response to treatment. There are currently at least 5 scar scales that were originally designed to assess subjective parameters in an objective way: The Vancouver Scar Scale (VSS), Manchester Scar Scale (MSS), Patient and Observer Scar Assessment Scale (POSAS), visual analog scale (VAS), and stony brook scar evaluation scale (SBSES). These observer-dependent scales consider factors such as scar height or thickness, pliability, surface area, texture, pigmentation, and vascularity. The measurements range across a continuum of values. Thus, the scales are best used to determine change within an individual rather than between individuals developed by using scales to make subjective methods more objective. The manchester scar scale, proposed by Beausang et al, includes an overall VAS (0-10 points) that is added to the individual attribute scores.²³ It assesses and rates 5 scar parameters: scar color (perfect, slight, obvious, or gross mismatch to

surrounding skin), matte or shiny, relationship to surrounding skin i.e. contour (range from flush to keloid), texture (range normal to hard), distortion (none to severe). Scores from the 2 scales are added together to give an overall score for the scar, with higher scores representing clinically worse scars (5 best to 28 worst).

In our study cosmesis was assessed by using Manchester Scar Scale on 7th POD, 3 months postoperatively and 6 months postoperatively. The mean cosmesis score in SILS 7th POD was 6.0 ± 0.587 and in CLA was 6.9 ± 0.922 . MSS was used to assess scar 3 months postoperatively; mean cosmesis score in SILS was 5.73 ± 0.691 and in CLA was 6.56 ± 1.072 . Cosmesis score in SILS was better 6 months postoperatively with mean score of $5.33 \pm (0.606)$, while in CLA it was 6.23 ± 1.104 . Majority of SILS patients had excellent cosmetic results (Figure 2 to 9).

The difference in mean cosmesis score between SILS and CLA was statistically significant ($p < 0.05$). The reason for this is that SILS procedure is virtually scarless, as the single scar gets buried in the dimple of umbilicus.

Similar cosmetic results were published by Vilallonga R et al²⁴ in which mean satisfaction of cosmetic result was better in SILS than CLA and the difference was statistically significant ($p < 0.05$).

CONCLUSION

Our comparative study between single incision laparoscopic appendectomy and conventional laparoscopic appendectomy shows that besides better cosmetic results in the former, there are no added advantages. However, SILS can be a safe and feasible alternative in young females who are cosmesis-conscious.

SILS is safe, feasible and reproducible procedure with conventional laparoscopic instruments. The primary outcomes seem comparable with those for conventional laparoscopic procedure. SILS is technically difficult and demands a learning curve. The operating times are reasonable and can be lessened with experience. Cosmesis scoring and patient preference continue to favor SILS.

The most important reason for patients of acute appendicitis opting for SILS is its cosmetic benefit. Women especially the younger ones do not want to have any scar on their virgin abdomen and they choose SILS for this purpose. SILS was perceived as “No Scar Surgery” by most of our patients while few of our patients’ perception was “as having undergone no surgery” on their abdomen.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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