

**Comparative Study of Single Incision Laparoscopic Appendectomy (SILA) Using Conventional Instruments versus Conventional Laparoscopic Appendectomy (CLA)**

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**Type of Publication:** Original Research Paper

**Conflicts of Interest:** Nil

**Abstract**

**Purpose:** For the treatment of acute appendicitis, a conventional laparoscopic appendectomy (CLA) has been widely performed. Recently, the use of single incision laparoscopic appendectomy (SILA) is increasing because it is believed to have advantages over conventional laparoscopic surgery. In this study, we compared SILS and CLA.

**Methods:** In the present study two groups were included for comparison of base parameters. A total of 35 patients were underwent SILA using conventional instruments group (SILA Group) and other 35 patients were underwent CLA group. Two groups were compared for base parameters including operation times, hospital stay, cosmesis, postoperative pain and complications.

**Results:** The patients' demographics were not significantly different between the two groups. Mean duration of surgery in SILA group: 39.14±5.95 minutes and in CLA group: 36.08±9.23 minutes,  $p > 0.05$ . The mean cosmesis score of the patients with SILA group was

5.8 and with CLA group was 6.91. The mean Manchester cosmic score analysis showed SILA group was better in cosmesis than CLA group with significant difference;  $p < 0.0001$ . There were no significant differences in the mean hospital stays, use of nonsteroidal anti-inflammatory drugs, and wound infections between the two groups.

**Conclusion:** Postoperative pain, complications and hospital stay showed no statistically significant differences between the SILS and the CLA groups. However, SILA using conventional instruments is seen as safe and feasible as CLA with better cosmesis and eliminates extra cost for this advance surgery.

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

**Introduction**

Mc Burney's point (Gridiron) incision for open appendectomy remained the procedure of choice until 1983 when Kurt Semm<sup>1</sup> offered an alternative "laparoscopic appendectomy".

Over the last decades surgeons have been in a bid to be less invasive and provide greater comfort to patients and have developed means of access to the abdominal cavity with negligible surgical trauma and ultimate cosmesis such as single-incision laparoscopic surgery (SILS).

Rather than the traditional four to five small incisions, a single surgical abdominal access is created through which multiple instruments are inserted simultaneously via a large caliber single-port device or via small adjacent ports placed into one or multiple fascial incisions. All surgical instruments are placed through this small incision and also the incision site is located in the left or right abdomen or umbilicus. With the benefits of fewer scars, the opportunity of less pain, and shorter recovery periods, SILS is one of the recent laparoscopic techniques. However SILA is technically more difficult procedure because it involves manipulating three articulating instruments through one access port and the high cost of special instruments such as the TriPort, the SILS port, the Uni-X Single Port System also increased the cost of surgery<sup>2</sup>.

Along with recent advances in surgical instruments and techniques, single-incision laparoscopic surgery (SILS) and natural orifice transluminal endoluminal surgery are experimentally being performed for cosmetic improvements. This study aimed to compare the results or outcome of single-incision laparoscopic appendectomy (SILA) using conventional instruments and conventional laparoscopic appendectomy (CLA) in patients of appendicitis.

## **Methods**

### **Study population**

The study comprised patients who underwent SILA (n = 35) or a CLA (n = 35) conducted by the same surgeon. The study included patients who were admitted to the

Department of General Surgery of Vivekananda Institute of Medical Sciences, Ramakrishna Mission Seva Pratishthan Hospital, Kolkata. Study conducted from September 2016 to October 2017(14months). The operative techniques were selected randomly regardless of gender and age of patients and were performed in almost identical ratios. Medical records were used to conduct a retrospective comparative analysis of sex, age, operation time, admission days, the number of painkillers injected, the presence of complications, etc.

### **Inclusion criteria**

Patients aged > 12 years, with history of appendicitis proven by clinically and radiologically; considered fit for elective laparoscopic appendectomy were included in the study.

### **Exclusion criteria**

Patients suspected of complicated appendicitis; patients with previous open abdominal surgery; severe cardiac or pulmonary disease; patients unfit for general anesthesia and with aged >65 years; pregnancy and patients refused to consent.

## **Surgical methods**

### **Single Incision Laparoscopic Appendisectomy**

We used conventional laparoscopic ports and instruments for this procedure.

### **Port Placement**

We use Curcillo's method for port placement. A 20 mm curvi-linear incision was given vertically through umbilicus. Then a skin flap is lifted up. First a 10 mm port is introduced by closed technique.



Figure 1: Port position in SILA using conventional instruments

Pneumoperitoneum created upto a pressure of 12-15 mm of Hg. Once appendicitis was confirmed then other two 5 mm ports are introduced through the same incision creating a pseudo-triangulation between all three ports (Mickeymouse fashion). The ports are placed at a distance to each other. Camera port was kept at the apex of the triangle.

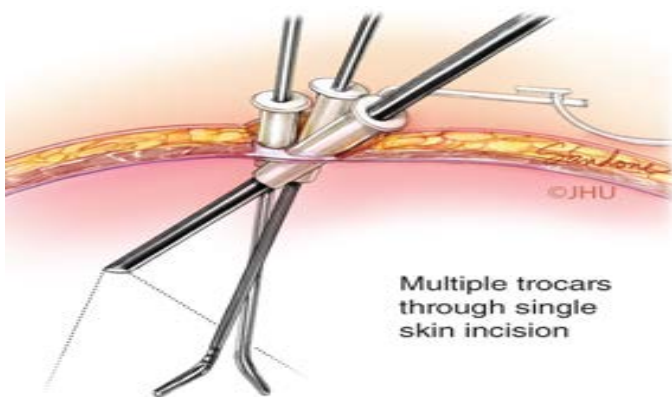


Figure 2: Pseudo-triangulation using conventional instruments

## Results

### Comparison of base parameters

The mean age of the patients in SILA group was 26.7 years (18-42 years) and in CLA group was 27.3 years (18-48 years) ( $p>0.05$ ). In SILA group Male:Female ratio is 1:1.5 and in CLA Group ratio is 1:1.2 ( $p>0.05$ ). Thus the

patients of the two groups were matched for age and gender.

The mean operating time in the SILS group was 39.14 min (30-55) and in the CLA group 36.08min (25-60). This difference was not statistically significant ( $p>0.05$ ).

VAS score at 6 hrs was 4.22 for SILA group and 4.05 for CLA group; at 12 hrs 3.17 for SILA group and 2.82 for CLA group; at 1.42 for SILA group and 1.40 for CLA group. The difference in the postoperative pain score of the two groups was not statistically significant ( $p>0.05$ ).

Proportion of patients with post operative wound infection in both the groups was equal (2.9%). Of total 35 patients in SILA group only in 1 case a extra port was used. No conversion to open in both the groups. Since one of the cell frequencies was zero Chi-square test could not be applied. However, proportion of patients with extra port placement in SILA group (2.9%) was higher than that of CLA group (0.0%). But Fisher Exact test showed that there was no significant difference in the two groups in respect of extra port placement ( $p=0.50$ ).

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

The mean Manchester scar scale for cosmesis in SILA group was 6.38 (5-9) and in CLA group was 6.91(5-9) and the median was 7. Chi-square test showed that there was significant association between Manchester Scar Scale for Cosmesis and patients of the two groups ( $p<0.0001$ ). Proportion of patients with high value of Manchester Scar Scale for Cosmesis was significantly higher of the patients in CLA group (67.6%) as compared to SILA group (17.1%). t-test showed that the mean Manchester scar scale for cosmesis of the patients of CLA group was significantly higher than that of the patients of SILA group ( $t_{68}=5.20; p<0.0001$ ).

## 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- 39.14 minutes in SILS group; 36.08 minutes in CLA group, though this difference was not statistically significant ( $p>0.05$ ).

Sateesh S et al<sup>3</sup>, Wani M et al<sup>4</sup>, Buckley et al<sup>5</sup>, Raakow et al<sup>6</sup>, Lee WS et al<sup>7</sup>, Kim JH et al<sup>8</sup> also published similar reports.

Markar SR et al<sup>9</sup>, Frutos MD et al<sup>10</sup>, Carter JT et al<sup>11</sup>, Xu AM et al<sup>12</sup>, Antoniou SA et al<sup>13</sup>, Aly OE et al<sup>14</sup> reported longer operative times for SILA group. The relatively increased operative time in SILS can be accounted to the initial learning curve due to crowding of instruments.

### Post operative pain

Postoperative pain was assessed by visual analogue scale on a score of 1 to 10. In the whole population VAS score analysis for different post operative times showed that there was a significant higher VAS score at 6 hrs hours as compared to VAS at 24 hrs in both groups, probably because of vigorous manipulation while using wound retractor in umbilical wound so as to create adequate fasciotomies. VAS score at 6 hrs was 4.22 for SILA group and 4.05 for CLA group; at 12 hrs 3.17 for SILA group and 2.82 for CLA group; at 1.42 for SILA group and 1.40 for CLA group. The difference in the postoperative pain score of the two groups was not statistically significant ( $p>0.05$ ). In the immediate post – operative period same generation of opiate analgesics were used in both. No additional dose of analgesia was required in SILA group than CLA.

In their study Wani M et al<sup>4</sup> found VAS score at 12hrs for SILA group was  $3.4\pm0.498$  and for CLA group was

$3.2\pm0.430$ , and VAS score at 24 hrs for SILA group was  $1.9\pm0.999$  and for CLA group was  $2.0\pm0.980$  with no statistically difference in between two study groups, corroborates to our study. Sateesh S et al<sup>3</sup> also published similar result.

Studies conducted by Carter JT et al<sup>11</sup>, St Peter SD et al<sup>15</sup>, Baik SM et al<sup>16</sup> shows SILA group associated with greater postoperative pain than CLA group, which contradict to current study.

### Post operative morbidity

In current study the only postoperative morbidity found is wound infection. There were a total of two cases of umbilical port site infection, one each in SILA group and CLA groups.

There was no incidence of intra abdominal abscess, adhesive ileus, caecal leak, vascular or any other visceral injury. Endobag was used in both the procedures for extraction of appendix through umbilical port.

Similar studies were published by Xu AM et al<sup>12</sup>, Marker SR et al<sup>9</sup>, Raakow et al<sup>6</sup>. St Peter et al<sup>15</sup> and Teoh AY et al<sup>17</sup> shows more wound infections in SILA compared to CLA. Whereas Kim et al<sup>8</sup>, Lee et al<sup>7</sup> had opposite results.

### Conversion to open (Extra port placement)

In our study no patient in either group required conversion to open surgery. But one patient in SILA group required additional port placement. Fisher Exact test showed that there was no significant difference in the two groups in respect of port placement ( $p=0.50$ ).

Similar results published by Zhang Z et al<sup>18</sup>, who showed that no conversion to open required in both SILA group and CLA groups.

Buckley FP et al<sup>5</sup> shows 0.93 % of CLA group and 2.38 % of SILS appendectomies were converted to open procedure but this difference was not statistically significant ( $p = 0.65$ ). Hua J et al<sup>37</sup> in their meta analysis

revealed similar conversion rate in both groups. Careful selection of inclusion and exclusion helped minimize the conversion to open.

#### **Duration of hospital stay**

The mean duration of hospital stay of the patients with SILA group was 2.25 days and 2.34 days in CLA group. The difference was not statistically significant ( $p>0.05$ ).

Wani M et al<sup>4</sup> published similar data wherein they reported mean duration of hospital stay in SILA group 3.4 days and 3.5 days in CLA group with no significant difference in both groups.

Steesh et al<sup>3</sup>, Marker SR et al<sup>9</sup>, Raakow et al<sup>6</sup> and Aly OE et al<sup>14</sup> concluded that there is no significant difference in duration of hospital stay in both groups which supports our study.

#### **Return to normal activity**

The mean time to return to normal activities of the patients after discharge from hospital with SILA group was 3.65 days and in CLA group was 3.71 days; the difference was not statistically significant ( $p>0.05$ ).

Similar result was published by Wani M et al<sup>4</sup> in which mean duration of return to work was 3.5 days in SILA group and 3.6 days in CLA group with no statistical difference in two groups ( $p>0.05$ ). Aly OE et al<sup>14</sup> and Zhang et al<sup>18</sup> published similar studies.

Contradicting result was found in a study conducted by Zhou H et al<sup>19</sup>, which showed less time to return to normal activities in SILA group as compared to CLA group.

#### **Cosmetic results**

In our study cosmesis was assessed by using Manchester Scar Scale. The Manchester scar scale, proposed by Beausang et al<sup>20</sup>, includes an overall VAS (0-10 points) that is added to the individual attribute scores. 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).

#### **Mean score of Manchester Scar Scale for Cosmesis**

The mean cosmesis score of the patients with SILA group was 5.8 and with CLA group was 6.91. The mean Manchester cosmic score analysis showed SILA group was better in cosmesis than CLA group with significant difference ( $p<0.0001$ ).

Corroborating to current study Wani M et al<sup>4</sup> published the mean Manchester cosmesis score in SILS group was  $5.73\pm0.691$  and in CLA group was  $6.56\pm1.072$ . The difference in mean cosmesis score between two groups was statistically significant ( $p<0.05$ ). Similar cosmesis results were published by Teoh AY et al<sup>17</sup> They found improved cosmesis in the SILA group than in the CLA group ( $P < 0.00001$ ).

The single-incision method of laparoscopic appendectomy, compared to the conventional three-port method, has been a controversial issue in recent years. Numerous studies have been performed to evaluate the differences. New RCTs published between 2012 and 2017 evaluated the benefits and disadvantages of SILA and CLA in a quantitative manner. From a curative perspective, SILA is comparable to CLA in terms of total complications, length of hospital stay, and postoperative pain, operative time and conversion rate. One benefit of SILA is patient cosmetic satisfaction. Our study also arrived with almost similar outcomes. But still this needs further randomized controlled trial in evaluating to this new technique SILA to reveal its potential benefits.



## Conclusion

Our comparative study between single incision laparoscopic appendectomy and conventional laparoscopic appendectomy shows that SILA using conventional instruments is as safe and feasible as CLA with better cosmesis. Therefore, we conclude that SILA using conventional instruments may be performed safely as an alternative procedure for CLA, even in a small hospital with conventional surgical instruments, thereby, eliminating extra cost for this advance surgery.

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