

Comparative Study of Single Incision Laparoscopic Appendectomy (SILA) using Conventional Instruments versus Conventional Laparoscopic Appendectomy

Parshant Kumar^{1*}, Amit Jain², Gunjan Kumar Uikey³, Sachin Kalsan³

¹Resident Doctor, Department of General Surgery, SMS Medical College and Attached Hospital, Jaipur, Rajasthan, India

²Professor, Department of General Surgery, SMS Medical College and Attached Hospital, Jaipur, Rajasthan, India

³Resident Doctor, Department of General Surgery, SMS Medical College and Attached Hospital, Jaipur, Rajasthan, India

DOI: [10.36347/sasjs.2023.v09i05.024](https://doi.org/10.36347/sasjs.2023.v09i05.024)

| Received: 11.04.2023 | Accepted: 23.05.2023 | Published: 26.05.2023

*Corresponding author: Parshant Kumar

Resident Doctor, Department of General Surgery, SMS Medical College and Attached Hospital, Jaipur, Rajasthan, India

Abstract

Original Research Article

Background: Laparoscopic surgery has become the procedure of choice for treating appendicitis. But in this evolving era, single incision laparoscopic surgery for appendicitis is gaining importance because of its cosmetic benefits. So, here we compared outcomes of two laparoscopic surgeries in terms of intraoperative time, postoperative pain, postoperative hospital stay, postoperative tolerance to diet, postoperative complications & cosmesis. **Method:** A total of 100 patients who underwent laparoscopic appendectomy were studied. Patients were grouped under 2 categories randomly, group A undergoing single incision laparoscopic appendectomy (SILA) & group B undergoing conventional three port laparoscopic appendectomy (CLA). Post operatively, duration of surgery, post-operative time, post-operative hospital stay, tolerance to diet, patients satisfaction were monitored. **Result:** Our study included 100 patients- 50 in group A(SILA) & 50 in group B(CLA). Duration of surgery was significantly longer in group A as compared to group B(42.77 min vs 35.47 min ; $p < 0.001$). Patients had significantly lower pain score at 24 hours postoperatively in group A as compared to group B(3.38 vs 4.62, $p < 0.001$). Post-surgical complications in terms of superficial surgical site infection were more in group A(4 vs 2, p). There was no significant difference in postoperative hospital stay and tolerance to oral feed postoperatively. There was no conversion to open appendectomy in both the groups. There was significant higher patients satisfaction score in group A patients (8.40 vs 6.12, $p < 0.001$). **Conclusion:** In addition to better cosmesis after SILA, SILA inflicts considerable less pain postoperatively than CLA with no significant differences in postoperative tolerance to oral diet, surgical site complications & hospital stay.

Keywords: Single incision laparoscopic appendectomy, cosmesis, pain, postoperative.

Copyright © 2023 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Appendectomy is one of the common abdominal operations performed worldwide.

The open appendectomy, which was first described by Mc Burney [1] in 1894, has been accepted as the gold standard for around 100 years.

Since its introduction by Semm [2] in 1983, the laparoscopic appendectomy has been conducted more frequently than the open appendectomy due to its advantages of being minimally invasive, a better postoperative recovery, exploration of entire abdominal cavity (especially in obese patients and women of fertile age), management of unexpected findings, a quicker return to normal activities and a better cosmetic outcome.

During this era of laparoscopic surgery, surgeons are in a bid to be less invasive and provide great comfort to patients by developing means of access to abdominal cavity which leads to less surgical trauma such as natural orifice transluminal endoscopic surgery (NOTES) [3] and single incision laparoscopic surgery (SILS) [4-6]. SILS seems to be more widely used in surgical community and NOTES is still struggling with some technical and equipment difficulties.

Several operations are being performed by SILS technique including for example adjustable gastric banding, appendectomy, cholecystectomy, colectomy, hernia repair, hysterectomy, sleeve gastrectomy, nephrectomy, sacrocolpopexy, splenectomy, hepatectomy.

Citation: Parshant Kumar, Amit Jain, Gunjan Kumar Uikey, Sachin Kalsan. Comparative Study of Single Incision Laparoscopic Appendectomy (SILA) using Conventional Instruments versus Conventional Laparoscopic Appendectomy. SAS J Surg, 2023 May 9(5): 460-465.

METHODS

The hospital based prospective randomised study was conducted in the general surgery department at SMS medical college and attached group of hospitals, Jaipur.

Patients were diagnosed as acute appendicitis on the basis of clinical evaluation, blood investigation and ultrasound abdomen.

Patients with uncomplicated appendicitis were included in the study. Patients under 12 years of age, patients not willing for surgery, pregnant patients, patients with history of major lower abdominal surgery, patients with contraindication for laparoscopic surgery (e.g. patients with compromised cardiac status) or contraindications for general anaesthesia, patients with history of cirrhosis or coagulation disorder, patients with septic shock were excluded from the study.

Patients were assigned randomly either to SILA technique or CLA technique in the ratio of 1:1. Primary end point of our study were operative time (defined as from time of incision to wound dressing), postoperative pain at 24 hours, time taken to first oral feed comfortably, post-operative hospital stay, post-surgical complications in terms of surgical site infection and patients satisfaction score in terms of cosmesis.

Surgical Techniques

Both the procedures were done under general anaesthesia, being patient in supine position with slight

head end low and right up. Pneumoperitoneum created up to 10-12 mm hg with CO₂. Monitor was kept at feet end of the right side of patient and operating surgeon stood on the left side of the patient facing the monitor.

In CLA, three incisions for three ports were made: one 10mm port at just above the umbilicus for laparoscope, one 5mm port in right iliac fossa and one 10mm port in left iliac fossa. After introducing laparoscope in supraumbilical port and a grasper in other port, appendix was identified, lifted by its tip with the help of a grasper. Mesoappendix then targeted and separated from appendix with the help of harmonic scalpel. Appendicular base identified and ligated with the help of catgut endoloop and appendix was cut above the ligated end. Appendix was taken outside along with the 10mm port in left iliac fossa and the port was reinserted. Then, whole of the abdominal cavity examined for any other pathology especially terminal ileum for meckels diverticulum. All ports were taken out and incisions were closed with polypropylene 2-0 sutures and dressing done.

In SILA, a 20mm vertical transumbilical incision was made. Pneumoperitoneum created. One 10mm port and two 5mm ports were inserted side by side at different depths.

Laparoscope introduced through 10mm port and a 5mm non-traumatic grasper was also inserted.



Fig. 1: Transumbilical vertical skin incision



Fig. 2: Trocars in single incision

Appendix was visualised and held up by its tip with the help of grasper and mesoappendix separated by electrocautery. Appendicular base was ligated by endoloop and appendix cut above it. Whole of the abdominal cavity inspected for other pathology. 5mm trocar was exchanged with 10mm trocar for delivery of

appendix. All ports removed under vision after safe delivery of appendix. Fascial incision closed with polypropylene suture, wound is then irrigated and skin is closed with interrupted non-absorbable sutures and dressing was done.



Fig. 3: Umbilicus after wound closure in SILA

Postoperative Care

Patients were shifted to general surgical ward after the surgery and put on intravenous fluid, analgesics, and antibiotics. Patients allowed to take oral feed as soon as possible and their tolerance was measured. At 24 hours, their pain score measured according to pain scale. Patient discharged once stabled and started taking orally and was followed up thereafter to see postoperative complications if any and cosmetic assessment.

Statistical Analysis

All statistical assessments were performed using SPSS software. Continuous variables were presented as mean with standard deviation and categorical variables were expressed as counts with percentage. Student t test was used to assess continuous

variables and chi square test to assess categorical variables. We considered p value <0.05 as statistically significant.

RESULTS

100 patients were enrolled in the study. Of these, 50 patients underwent single incision laparoscopic appendectomy (group A) and 50 patients underwent conventional laparoscopic appendectomy (group B).

There was no significant age difference between both the groups. Proportion of male and female patients in both the study groups was almost similar. All patients were without any major comorbidities and have not undergone any major abdominal surgery in the past.

Table 1: Age and sex distribution

Characteristics p value	Group A	Group B
Age (years) 0.217	23 ± 9.07	25.84 ± 11.99
Sex		
Male 0.549	23(46%)	20(40%)
Female	27(54%)	30(60%)

Duration of surgery was significantly longer in SILA group as compared to CLA group (42.77 min vs 35.47 min, p<0.001). Pain was measured at 24 hours postoperatively using visual analogue scale(VAS) which was significantly lower in SILA group (3.38 vs 4.62, p<0.001).

Oral feed was given to patients when they passed flatus or first bowel sound arrived and there was no significant difference in resuming oral feed in both the groups. Postoperative complications were measured in terms of surgical site infection or any intra-abdominal collection postoperatively which was found slightly higher in SILA group.

Table 2: Comparison between SILA and CLA groups

Factors p value	Group A	Group B
Duration of surgery(min) <0.001	42.77±2.21	35.47 ±2.79
Postoperative pain score <0.001	3.38 ±0.75	4.62 ±0.87
Time to resume oral feed(hrs) 0.091	6.62 ±0.83	6.90 ±0.81
Postoperative stay(hrs) 0.164	41.22 ±6.54	42.94 ±5.70
Patients satisfaction score <0.001	8.40 ±0.61	6.12 ±0.55
Postoperative complications		
Yes	5(10%)	2(4%)
No	45(90%)	48(96%)

Intraoperatively, inflamed appendix was found. Along with it, adhesions were found in 31 patients in SILA group and in 27 patients in CLA group and also 2 patients in CLA group were having perforated appendix at the tip. Pathology was found to

be acute or chronic inflammation in majority of cases, apart from 4 cases in CLA group which were found to be having gangrenous changes on pathology. No atypical findings like malignancy were there.

Table 3: Intraop and pathology findings

	Group A	Group B
Intraoperative findings		
Inflammation with adhesions	31	27
Inflammation without adhesions	19	21
Gangrenous appendix	0	0
Perforated appendix	0	2
Ascites	0	0
Pathology findings		
Acute appendicitis	34	30
Chronic appendicitis	16	16
Gangrenous	0	4
Atypical findings	0	0

DISCUSSION

In the study, using single incision laparoscopic approach for appendectomy we noticed several advantages and some challenges over conventional laparoscopic approach.

Although many surgeons consider SILA to be technically more challenging, but with learning curve, increasing experience makes this approach available to the patients. In our study, we used conventional laparoscopic instruments for both the approaches and hence making no differences in the cost of surgery.

All SILA procedures were successful and there was no need to conversion either to three port or open approach. In a study of 33 patients by Hong and colleagues [7], 2 patients required conversion to conventional 3 port laparoscopic approach owing to gangrenous changes and 1 patient required additional drainage. A review of the literature by Ahmed and colleagues [8] in 2011 reported that the conversion rate

from SILA to CLA in published studies ranged from 0 to 41%.

In the present study, duration of surgery was significantly longer in SILA group than in CLA group (42.77 min vs 35.47 min, $p < 0.001$). Our results are similar to those of Kim and colleagues [9], who reported a mean duration of 61.3 (range 24–120) minutes for SILA, and those of Hong and colleagues [10] who reported a mean duration of 40.8 (range 15–90) minutes.

With regard to postoperative pain, we noticed significant lesser pain in SILA group as compared to CLA group (3.38 vs 4.62, $p < 0.001$) and also SILA group requiring lesser analgesia owing to lesser number of incisions in SILA group. Our results are comparable to the studies conducted by Frutos *et al.*, [11] and Ding *et al.*, [12] which also observed significant differences in pain with lesser pain observed in SILA group than in CLA group.

There was significant difference noted in terms of postoperative complications with higher patients developing surgical site infection in SILA group owing to their larger wound but none of them required readmission and all were corrected on subsequent dressing with proper wound irrigation. A number of factors influence this complication like patients age, any comorbidity, wound size, any bowel injury, appendicular stump leak. But none of our patients in both the group developed serious complications. A study done by Pan *et al.*, [13] says that one patient in single-incision laparoscopy group had incisional hernia on follow-up.

There was no significant difference noted in resuming to normal oral feed postoperatively in our study. Although a study conducted by Liang *et al.*, [14] stated SILA group returned to oral feed after 12 hours of surgery as compared to CLA group who started oral feed after 22 hours of surgery. Regarding to post-operative hospital stay, there was no significant difference in both the groups.

Patients were very satisfied in SILA group in terms of post-operative scar\ cosmesis as compared to CLA group (8.40 vs 6.12, $p < 0.001$). Buckley *et al.*, [15] also stated in his study that patients in SILA group were more happy regarding post-operative scar when compared with CLA group patients.

CONCLUSION

Our results indicate that single incision approach for laparoscopic appendectomy has acceptable benefits and effectiveness for treating appendicitis in the era in which people want scarless surgery.

In addition to offering cosmetic benefits, it also leads to less postoperative pain.

Although duration of surgery for SILA may be somewhat longer but it can be countered with increasing experience and hence is a very good and safe approach in young patients with uncomplicated appendicitis.

REFERENCES

1. McBurney, C. (1894). The incision made in the abdominal wall in cases of appendicitis, with a description of a new method of operating. *Ann Surg*, 20, 38-43.
2. Semm, K. (1983). Endoscopic appendectomy. *Endoscopy*, 15, 5964.
3. Merchant, A. M., Cook, M. W., White, B. C., Davis, S. S., Sweeney, J. F., & Lin, E. (2009). Transumbilical Gelpport access technique for performing single incision laparoscopic surgery (SILS). *Journal of Gastrointestinal Surgery*, 13, 159-162.
4. Saber, A. A., Elgamal, M. H., Itawi, E. A., & Rao, A. J. (2008). Single incision laparoscopic sleeve

- gastroectomy (SILS): a novel technique. *Obesity Surgery*, 18, 1338-1342.
5. Tagaya, N., Rokkaku, K., & Kubota, K. (2007). Needleoscopic cholecystectomy versus needleoscope-assisted laparoscopic cholecystectomy. *Surgical Laparoscopy Endoscopy & Percutaneous Techniques*, 17(5), 375-379.
6. Rispoli, G., Armellino, M. F., & Esposito, C. (2002). One-trocar appendectomy: sense and nonsense. *Surgical Endoscopy and Other Interventional Techniques*, 16, 833-835.
7. Hong, T. H., Kim, H. L., Lee, Y. S., Kim, J. J., Lee, K. H., You, Y. K., ... & Park, S. M. (2009). Transumbilical single-port laparoscopic appendectomy (TUSPLA): scarless intracorporeal appendectomy. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, 19(1), 75-78. [PubMed] [Google Scholar]
8. Ahmed, K., Wang, T. T., Patel, V. M., Nagpal, K., Clark, J., Ali, M., ... & Paraskeva, P. (2011). The role of single-incision laparoscopic surgery in abdominal and pelvic surgery: a systematic review. *Surgical endoscopy*, 25, 378-396. [PubMed] [Google Scholar]
9. Kim, H. J., Lee, J. I., Lee, Y. S., Lee, I. K., Park, J. H., Lee, S. K., ... & Oh, S. T. (2010). Single-port transumbilical laparoscopic appendectomy: 43 consecutive cases. *Surgical endoscopy*, 24, 2765-2769. [PubMed] [Google Scholar]
10. Hong, T. H., Kim, H. L., Lee, Y. S., Kim, J. J., Lee, K. H., You, Y. K., ... & Park, S. M. (2009). Transumbilical single-port laparoscopic appendectomy (TUSPLA): scarless intracorporeal appendectomy. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, 19(1), 75-78. [PubMed] [Google Scholar]
11. Frutos, M. D., Abrisqueta, J., Lujan, J., Abellan, I., & Parrilla, P. (2013). Randomized prospective study to compare laparoscopic appendectomy versus umbilical single-incision appendectomy. *Annals of surgery*, 257(3), 413-418.
12. Ding, J., Xia, Y., Zhang, Z. M., Liao, G. Q., Pan, Y., Liu, S., ... & Yan, Z. (2013). Single-incision versus conventional three-incision laparoscopic appendectomy for appendicitis: a systematic review and meta-analysis. *Journal of Pediatric Surgery*, 48(5), 1088-1098.
13. Pan, Z., Jiang, X. H., Zhou, J. H., & Ji, Z. L. (2013). Transumbilical single-incision laparoscopic appendectomy using conventional instruments: the single working channel technique. *Surgical Laparoscopy Endoscopy & Percutaneous Techniques*, 23(2), 208-211.
14. Liang, H. H., Hung, C. S., Wang, W., Tam, K. W., Chang, C. C., Liu, H. H., ... & Wei, P. L. (2014). Single-incision versus conventional laparoscopic appendectomy in 688 patients: a retrospective comparative analysis. *Canadian journal of Surgery*, 57(3), E89-E97.

15. Buckley, F. P., Vassaur, H., Monsivais, S., Jupiter, D., Watson, R., & Eckford, J. (2014). Single-incision laparoscopic appendectomy versus

traditional three-port laparoscopic appendectomy: an analysis of outcomes at a single institution. *Surgical endoscopy*, 28, 626-630.