

# SINGLE INCISION LAPAROSCOPIC APPENDECTOMY BY SUTURE LOOP TECHNIQUE IN CASES OF UNCOMPLICATED ACUTE APPENDICITIS

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## ABSTRACT

**Background:** Single incision laparoscopic appendectomy (SILA) is getting popular but is expensive due to the need of special equipment. Surgeons are thrived to develop different low cost techniques in order to decrease the cost. We herein describe an early experience of our own simplified low cost single incision laparoscopic appendectomy (SILA) technique with use of conventional laparoscopic instruments and a modified suture loop technique among patients with uncomplicated acute appendicitis (UAA). **Objective:** To determine the outcome of single incision laparoscopic appendectomy by an innovative suture loop technique among patients with uncomplicated acute appendicitis. **Methodology:** In this Quasi experimental study we performed SILA in 25 patients of all age and both sexes by using conventional non-reticulating laparoscopic instruments, 0° telescope, two 10mm ports and an innovative percutaneous suture loop (named Saad's loop) to suspend appendix for essential dissection around it. Any intraoperative or postoperative complications were noted. The patients were followed at least till 6 months after surgery. **Results:** We successfully completed SILA with our technique (Saad's loop) in all patients. The mean number of attempts to engage the loops was  $1.76 \pm 0.93$  and the mean operative time was  $36.72 \pm 11.23$  min. Suture loop did not cause trauma to appendix in any case. The mean VAS was  $0.20 \pm 0.50$ . All patients were discharged within two days. No intraoperative or postoperative complications were noted over a period of six months follow up. **Conclusion:** Our SILA technique with conventional laparoscopic instruments is simple and cost effective in patients with UAA by the use of innovative suture loop to suspend appendix. However, further randomized controlled trials with large sample size are recommended in assessing this new technique SILA to disclose its prospective benefits.

**Keywords:** Single-incision laparoscopic appendectomy, uncomplicated acute appendicitis, Suture loop.

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## INTRODUCTION

Acute appendicitis is the common emergency condition dealt on surgical floor. Life time risk of this commonest emergency is about 6 to 8%.<sup>1,2</sup> Appendectomies always remain a hot subject for general surgeon in every era. In times of open surgical approach, various skin incisions had been reported for appendectomy.<sup>3</sup> Later with introduction of laparoscopy, it's again a choice of procedure for the surgeon.<sup>4,5</sup> Now in this age of advance laparoscopy, Single Incision Laparoscopic Appendectomy (SILA) is getting popularity for patients with uncomplicated Acute Appendicitis (UAA).<sup>6-10</sup> However, SILA is expensive and is performed with the use of specially designed ports (SILS port, Gel port, etc), roticulating instruments, longer laparoscope with 30° or 45° angulation and energy devices like harmonic scalpel.<sup>11</sup> In developing countries, these gadgets are not readily available at every setup. So, with increasing trends towards SILA, several surgeons have come up with innovative and novel

approaches to perform SILA.<sup>12</sup> SILS, being more minimally access surgery, is considered superior to conventional multiport multi incision for appendectomy.<sup>13-15</sup> This scarless approach for the appendectomy attracts patients more.

We herein describe our own simplified and low cost technique for SILA among patients with UAA. This technique is simple, cost effective, safe and can be easily converted at any time to conventional multi incision laparoscopic appendectomy, if required by surgeon. This study was conducted to determine the outcome of single incision laparoscopic appendectomy by an innovative suture loop technique among patients with uncomplicated acute appendicitis.

## METHODOLOGY

In this quasi experimental study, a total of 25 patients of both sex and age more than 18 years with diagnosis of UAA were selected and admitted through Outpatient/ Emergency Department of Sharif Medical City Hospital from 1<sup>st</sup> July 2013 to 30<sup>th</sup> June

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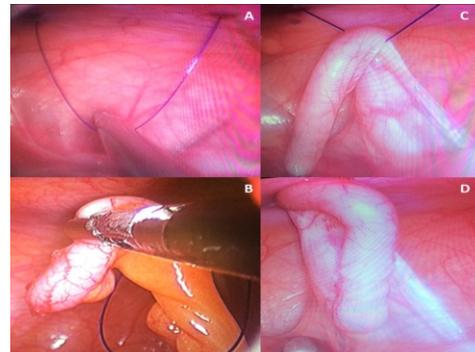
2014. Written informed consent was obtained from all patients. All the patients underwent SILA by our technique. The procedure was offered to all patients who were admitted with clinical diagnosis of UAA after establishing a diagnosis on clinical and radiological assessment (i.e. unremarkable ultrasonography of abdomen and pelvis). Patients who were suspected to have appendicular mass, perforated appendicitis, abscess or peritonitis on clinical or radiological grounds were debarred from this study. All the procedures were performed by a Fellow of Surgery who had at least 5 years experience of performing laparoscopic surgeries. Preoperative assessment like age and sex were noted. The patients were observed for intraoperative and postoperative parameters which were collected on specially designed proforma and statistical analysis was done using SPSS version 20.

### Surgical technique

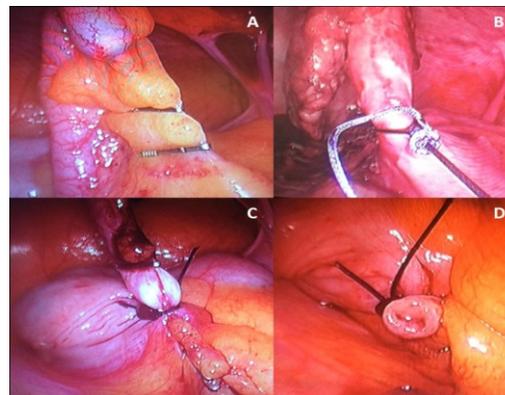
We applied SILA by the help of 0° laparoscope, conventional non reticulating laparoscopic instruments (grasper, dissector, knot pusher, clip applicator and scissors) and a modified suture loop (named Saad's loop), formed by a non-absorbable suture material on straight needle (Prolene 2/0, Silk 2/0), to keep this technique simple, easy and low cost. Routine preparation of surgery was similar to that of any laparoscopic surgery. Surgery was carried out under general endotracheal anesthesia. The patient's position and surgeon's position were similar to that of a conventional laparoscopic appendectomy. The one difference from conventional technique was that surgeon himself operated the camera in his non dominant hand thus eliminated the need for assistant to hold the camera. The umbilicus was infiltrated with 0.25% bupivacaine as pre-emptive analgesia. A 1.5 -2 cm long, crescent shape skin incisions was made along left side of umbilicus after everting the umbilicus with towel clip. The incision was then deepened up to linea alba. For creation of pneumoperitoneum, a Veress needle was introduced in the peritoneal cavity through the same incision. Two 10mm ports were then introduced through linea alba in midline, above and below the umbilicus leaving a facial bridge between ports. Pneumoperitoneum was raised to a pressure of 12 mm Hg. The patient was then placed in Trendelenburg position with his left side downwards. Laparoscope was introduced

through one port inside the peritoneal cavity to inspect the abdominal organs. The bowel was retracted with camera or a blunt instrument introduced through second transumbilical port. The appendix was grasped, pushed upward and laterally to press against the abdominal wall internally. Then, this point was marked externally for creation of innovative suture loop. The suture loop (named Saad's loop) was constructed with the help of a nonabsorbable suture on straight needle by introducing it directly into peritoneal cavity at the marked area in the right iliac fossa. The needle was brought in, held by grasper, rotated inside the abdominal cavity, and reinserted back to abdominal wall near the point of entry of the needle. The needle was then received over the skin by a hemostat. By passing the need percutaneously, a loop was created which was hanging with abdominal wall freely inside the peritoneal cavity. (Figure IA)

**Figure I:** A). Innovative suture loop (Saad's loop) hanging inside peritoneal cavity. B). Appendix grasped by the tip and brought in the loop. C). Appendix is pulled by surgeon at suitable site. D). Free ends of loop are tightened to suspend the appendix across abdominal wall.



**Figure II:** A). Metallic clips applied at root of appendix. B). Extracorporeal knot applied at the base of appendix. C). Clip applied at opposite side of knot. D). Dissection done between the clip and knot.



A grasper was then passed through the loop and appendix was held by its tip. (Figure IB) The grasper was pulled by the surgeon. By this maneuver, the appendix was trapped inside the loop. (Figure IC) The assistant then pulled the hemostat to tighten the loop, which hanged the appendix along with mesoappendix across the abdominal wall. This helped in suspending the appendix for necessary dissection. (Figure ID).

Mesoappendix was controlled with ordinary LT Clips 300 or 400, applied at its root and was separated from appendix, uptill its base, with scissors or cautery. (Figure IIA) For a broader mesoappendix, more clips can be applied. Base of appendix was recognized and ligated using extracorporeal knotting with absorbable suture (Vicryl 1). (Figure IIB) A metallic clip was applied opposite to knot to avoid spillage from distal end of appendix after dividing. (Figure IIC) Appendix was then divided between knot and the clip with laparoscopic scissor. (Figure IID) The appendix was then grasped with an ordinary grasper and pulled outside through the second 10 mm port.

Edges of fascial incision and skin wound were then closed with nonabsorbable sutures (Figure III). A small gauze dressing with tape was done. Post-operative care was similar to the conventional laparoscopic appendectomy. Early mobilization was encouraged and patient was usually discharged on first post-operative day.

**Figure III:** Incision closed with non absorbable suture



## RESULTS

The mean age of patients in our study was  $26.25 \pm 5.04$  years. There were 14 female and 11 male patients. SILA was completed fruitfully in all

patients without any intraoperative or postoperative complication. None of the patients had any co morbid condition. The mean number of attempts to engage the loops was  $1.76 \pm 0.93$  and the mean operative time was  $36.72 \pm 11.23$  minutes. Electrocautery was used in 3 (12%) cases. None of the patients had intraoperative hemorrhage from appendicular artery or trauma to appendix caused by Suture loop. We did not observe difficulty in extraction of specimen in any patient. The mean VAS was  $0.20 \pm 0.50$  and the mean hospital stay was  $1.12 \pm 0.33$  days. There were 5 (20%) patients who required opioid analgesia postoperatively. None of the patients had port site hematoma/ seroma or wound infection. Longer Operative time and manifold attempts to suspend appendix in modified suture loop were experienced in first few cases but these improved gradually. All patients were discharged within 2 days interval.

## DISCUSSION

SILA is preferred over conventional laparoscopic techniques due to its advantages of less operative trauma, less pain, early recovery and early discharge from hospital. However, one of its disadvantage is the cost of modern gadgets and ports etc, which are not readily available in remote setups. In this series, we describe our initial experience of 25 cases with SILA. Amongst the other previously defined techniques for SILA, our technique is simpler, easier, cost effective and can be implemented in those sets up where modern gadgets like ultrasonic shear, 30° and 45° laparoscope and reticulating instruments are not accessible or patient could not afford the cost of procedure. Moreover it does not add up the cost of conventional laparoscopic procedure as expensive instruments or equipment is not required. In our technique, we introduced both 10mm ports in the midline through linea alba to minimize trauma to rectus muscles and hence prevention from any risk of hemorrhage from muscles. Fascial bridge between ports served to reduce the collision of ports and allowed easy maneuverability of instruments during procedure. Reduction in fascial incision size to 5mm each can be considered by the use of both 5mm ports if 5mm laparoscope and same sized clip applicator are available. Patient selection was very important. So, we selected the patients on clinical basis and the selection was again confirmed by first scrutinizing the peritoneal cavity with laparoscope to rule out complicated appendicitis or any other pathology. Even a third port in right iliac fossa or at other

appropriate site can be implanted if requires. However, we did not need it in any of the case.

Our key maneuver was to suspend the appendix within a modified suture loop which is readjustable according to need of surgeon by simply manipulating and altering the position of appendix by means of ordinary laparoscopic grasper. This simple suture loop excludes the need of third port or instrument or any special needle. The idea of suture loop was taken from single incision laparoscopic cholecystectomy where the suture is passed through fundus of gall bladder to hitch it against abdominal wall for retraction.<sup>16</sup> Previously, some other techniques have been devised by different authors for suspension of appendix during SILA. Jiang,<sup>17</sup> used a fine copper wire passed transabdominally to suspend the appendix. Roberts,<sup>18</sup> used an intracorporeal pulley and Akgur,<sup>19</sup> used a polypropylene suture folded in angiographic catheter passed transabdominally. Bhattia,<sup>20</sup> used an epidural needle based suture loop. Some other authors have described percutaneous organ holding devices (suture grasper closure device, Mediflex Surgical Products, Islandia, NY, USA).<sup>21,22</sup>

As compared to our technique, the use of epidural needle, angiographic catheter or copper wire raises the cost of procedure. We preferred an ordinary non absorbable suture on straight needle, which causes less trauma as compared to other needles and theoretically also lessens the probabilities of gas leakage as from lumen of epidural needle or angiographic catheter. Percutaneous suture loops had also been used by Ates<sup>23</sup> and Lee,<sup>24</sup> to suspend appendix but they passed this suture through the mesoappendix and they had to pass more than one suture through mesoappendix in single patient to adjust desired position of appendix. Our technique is simpler as suture does not pass through mesoappendix so chances of trauma to appendix and mesoappendix are negligible and we can effortlessly readjust the position of appendix in loop as per required by surgeon. We observed relatively longer time and more numbers of attempts to grasp the appendix which gradually reduced in subsequent cases with more experience.

The consumption of ordinary liga clips (LT 300 or LT 400) for controlling mesoappendix eliminates the need of energy devices. Extracorporeal Roder's knot around base of appendix is also cost effective alternative of expensive endoloops and

endostapler.

We grabbed the aid of second 10mm port to retrieve good sized appendix specimen and this will also diminishes the chances of wound contamination. If there is difficulty in specimen extraction through 10mm port or if 5mm ports are used then both port spots can be aggregated to extract specimen. Wound was closed with interrupted non-absorbable sutures which were removed after 7 days interval. We did not see any of the wound infection, or port site hernia during a 6 month follow up. All of our patients were discharged within two days of surgery.

One of the limitation of the study was its small sample size and all the procedures were performed by a single surgeon at a single center. Reproducibility of the procedure at different setups need to be assessed. We also need larger multicentre trials before making any strong recommendations.

## CONCLUSION

We conclude that our initial experience of SILA with innovative suture loop is feasible and safe. It can be carried out at setups where modern gadgets are not available. However, we need larger series before making any recommendation.

## REFERENCES

1. Davies GM, Dasbach EJ, Teutsch S. The burden of appendicitis-related hospitalisations in the United States in 1997. *Surg Infect (Larchmt)* 2004;5:160-5.
2. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol* 1990;5:910-25.
3. McBurney C. The incision made in the abdominal wall in cases of appendicitis, with a description of a new method of operating. *Ann Surg* 1894;20:38-43.
4. Bennett J, Boddy A, Rhodes M. Choice of approach for appendectomy: A meta-analysis of open versus laparoscopic appendectomy. *Surg Laparosc Endosc Percutan Tech* 2007; 17:245-55
5. Guller U, Hervey S, Purves H, Muhlbaier LH, Peterson ED, Eubanks S, et al. Laparoscopic versus open appendectomy: Outcomes comparison based on a large administrative database. *Ann Surg* 2004;239:43-52.
6. Teoh AY, Chiu PW, Wong TC, Poon MC, Wong SK, Leong HT, Lai PB, Ng EK. A double-blinded randomized controlled trial of laparoendoscopic single-site access versus conventional 3-port appendectomy. *Ann Surg* 2012; 256:909-914.
7. Lee WS, Choi ST, Lee JN, Kim KK, Park YH, Lee WK, Baek JH, Lee TH. Single-port laparoscopic appendectomy versus conventional laparoscopic appendectomy: a prospective randomized controlled study. *Ann Surg* 2013; 257:214-218.
8. Perez EA, Piper H, Burkhalter LS, Fischer AC. Single-incision laparoscopic surgery in children: a randomized

- control trial of acute appendicitis. *Surg Endosc* 2013; 27: 1367-1371.
9. St Peter SD, Adibe OO, Juang D, Sharp SW, Garey CL, Laituri CA, Murphy JP, Andrews WS, Sharp RJ, Snyder CL, Holcomb GW, Ostlie DJ. Single incision versus standard 3-port laparoscopic appendectomy: a prospective randomized trial. *Ann Surg* 2011; 254: 586-590.
  10. Sozutek A, Colak T, Dirlik M, Ocal K, Turkmenoglu O, Dag A. A prospective randomized comparison of single-port laparoscopic procedure with open and standard 3-port laparoscopic procedures in the treatment of acute appendicitis. *Surg Laparosc Endosc Percutan Tech* 2013; 23: 74-78.
  11. Hirano Y, Watanabe T, Uchida T, Yoshida S, Tawaraya K, Kato H, Hosokawa. Single-incision laparoscopic cholecystectomy: Single institution experience and literature review. *World J Gastroenterol* 2010 January 14; 16(2): 270-274.
  12. Rehman H and Ahmed I. Technical approaches to single port/incision laparoscopic appendectomy: a literature review. *Ann R Coll Surg Engl.* 2011 Oct; 93(7): 508-513.
  13. Oltmann SC, Garcia NM et al. Single-incision laparoscopic surgery: feasibility for pediatric appendectomies. *J Pediatr Surg* 2010;45:1208-1212
  14. Nguyen NT, Reavis KM, Hinojosa MW, Smith BR, Stamos MJ. A single-port technique for laparoscopic extended stapled appendectomy. *Surg Innov* 2009;16:78-81
  15. Hong TH, Kim HL, Lee YS, Kim JJ, Lee KH, You YK, Oh SJ, Park SM. Transumbilical single-port laparoscopic appendectomy (TUSPLA): scarless intracorporeal appendectomy. *J Laparoendosc Adv Surg Tech* 2009;19:75-78
  16. Philipp SR, Miedema BW, Thaler K, Single-Incision Laparoscopic Cholecystectomy Using Conventional Instruments: Early Experience in Comparison with the Gold Standard. *J Am Coll Surg* 2009;209:632-637.
  17. Jiang CH, Yao N, Fang XM. Clinical application with laparoscopic appendectomy in single-port and suspension method. *J Laparosc Surg.* 2008.
  18. Roberts KE. True single-port appendectomy: first experience with the 'puppeteer technique'. *Surg Endosc.* 2009; 23(1): 825-830.
  19. Akgür FM, Olguner M, Hakgüder G, Ateş O. Appendectomy conducted with single port incisionless-intracorporeal conventional equipment-endoscopic surgery. *J Pediatr Surg.* 2010; 45 (1):061-063.
  20. Bhatia P, Sabharwal V, Kalhan S, John S, Deed JS, and Khetan M. Single-incision multi-port laparoscopic appendectomy: How I do it. *J Minim Access Surg.* 2011 Jan-Mar; 7(1): 28-32.
  21. Joshi MR, Shrestha SK, Thapa PB, Koirala U, Bhattarai P, Dongol UMS, Singh DR, Sharma SK. Use of percutaneous thread loop to hold the vermiform appendix during laparoscopic appendectomy. *Kathmandu University Medical Journal.* 2007 ;5(1):63-67.
  22. Lee J, Lee SR, Kim HO, Son BH, Choi W. Outcomes of a Single-Port Laparoscopic Appendectomy Using a Glove Port With a Percutaneous Organ-Holding Device and Commercially-Available Multichannel Single-Port Device. *Ann Coloproctol.* 2014 Feb; 30(1): 42-46.
  23. Ateş O, Hakgüder G, Olguner M, Akgür FM. Single-port laparoscopic appendectomy conducted intracorporeally with the aid of a transabdominal sling suture. *J Pediatr Surg.* 2007;42(1):071-074.
  24. Lee SY, Lee HM, Hsieh CS, Chuang JH. Transumbilical laparoscopic appendectomy for acute appendicitis: a reliable one-port procedure. *Surg Endosc.* 2011;25(1):115-120.