

Case Series

A study of single sight two port laparoscopic appendectomy for its feasibility, advantages and disadvantages

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ABSTRACT

Minimally invasive techniques revolutionized surgery with severe reduction of access trauma, prompt mobilization, lessened hospital stays and better cosmesis.¹ Laparoscopic appendectomy can be further categorized into three port and reduced port appendectomy. All the selected cases have been put in a tabulated form on the basis of their age, clinical features and signs, ultrasonography findings, intra op complications, duration of surgery, duration of post op pain, early post op complications, cosmetic outcome and trochar size. 20 patients fulfilling inclusion and exclusion criteria, who were admitted in our hospital (SMIMER Surat) from 1st December, 2019 to 1st April 2020 and were included in the study and underwent single sight two port laparoscopic appendectomy (SSTPLA) after their consent. We have covered the entire procedure of single sight two port appendectomy, its technique, feasibility, advantages, and disadvantages. From our study, we conclude that this new technique of SSTPLA is technically safe and feasible. Our experience of this innovative surgical technique is suggestive of the fact that SSTPLA has better patient satisfaction with respect to cosmesis, decreased post-operative pain, decreased hospital stay, decreased operative time, fewer intra operative and post-operative complications and surgeon satisfaction with respect to ergonomics and decreased chances of collision of laparoscope with only single working instrument.

Keywords: SSTPLA, Single incision laparoscopic appendectomy, Open appendectomy, Laparoscopic appendectomy

INTRODUCTION

Appendicitis is defined as inflammation of the vermiform appendix and is a common disease, with a life-long occurrence rate of 7-8%.¹

Minimally invasive techniques revolutionized surgery with severe reduction of access trauma, prompt mobilization, lessened hospital stays and better cosmesis.² One of the minimally invasive techniques which has been developed through these years is that of laparoscopic appendectomy. From open appendectomy to novel laparoscopic techniques, patients have benefited in various ways with cosmesis being the most appreciated one. We are presenting this paper regarding single sight two port laparoscopic appendectomy (SSTPLA) as

cosmetically superior procedure for selected patients with acute appendicitis.

Although anatomists such as Vesalius and Leonardo Da Vinci had written about the appendix, Claudius Amyand in the early 18th century was the first surgeon to describe a successful appendectomy in subsequent centuries, significant progress was made in the diagnosis and management of appendicitis, especially after Chester McBurney advocated for early appendectomy in his 1889 publication McBurney is credited with consolidating the surgical technique of the open appendectomy (OA) in 1894, an approach that has not significantly changed in the last 120 years in 1983 with the advent of the first described minimally invasive laparoscopic appendectomy (LA) by Semm, medicine slowly shifted away from the

OA.³⁻⁵ LA has become the standard of practice in uncomplicated appendectomies in most minimally invasive institutions.

OA is widely considered the gold standard in complicated appendicitis (gangrenous and perforated appendices) due to decreased intra-abdominal infectious complications in the postoperative period.⁶ It is also used as an intra-operative backup plan for LA in cases where there is severe appendiceal inflammation (the main reason for conversion to open) or if there are significant adhesions from a previous surgery all making safe laparoscopic dissection of the appendix nearly impossible.⁷ Open appendectomy is usually preferred in complicated appendicitis such as perforated appendix, gangrenous appendix, appendicitis with abscess or phlegmon whereas laparoscopic approach is preferred in uncomplicated appendicitis especially in women, morbidly obese, pediatrics (above 5 years) and geriatric population. In pediatric patients under the age of 5, where the abdomen is too small for the basic physical requirement of LA, and in pregnancy, due to the risk to the foetus from LA, laparotomy is also still preferred over laparoscopy.⁸ Laparoscopic appendectomy can be further categorized into three port and reduced port appendectomy. Mini-laparoscopy is an emerging area of minimally invasive surgery that involves the use of miniature (2 mm diameter) laparoscopic instruments. The premise of mini-laparoscopy is that smaller instruments cause less abdominal wall trauma and, consequently, minimize pain and the stress response to surgery.⁹ In this paper we have discussed about the single site two port laparoscopic appendectomy with proper description of technique, patient selection, its advantages and disadvantages. Objectives of this prospective study were to document - feasibility of the procedure in patients undergoing single sight two port laparoscopic appendectomy (SSTPLA), advantages of the procedure (operative time, hospital stay, post-operative pain, cosmetic outcome, and disadvantages of the procedure (conversion to standard three port technique or open surgery, intra operative, peri operative and post-operative complications). SSTPLA was also developed to place 2 basic trocars into a single incision, with the aim of reducing the number of incisions and lowering the cost.¹⁰

CASE SERIES

In our study most common age group was 15-30 years (50% cases) followed by 31-40 years (30% cases). In our study most common symptom was pain in right iliac fossa 80% followed by fever 70% and vomiting 50%.

In our study, right iliac fossa tenderness was present in 100% cases. Patients with generalized tenderness were the same who experienced rigidity and those were the cases which had to be converted to either open or conventional three port laparoscopic appendectomy due to severe adhesion/lump formation/perforation.

Table 1: Age distribution.

Age group (in years)	No. of cases	%	Male	Female
15-30	10	50	6	4
31-40	6	30	4	2
41-50	4	20	4	0
51-60	0	0	0	0
61-70	0	0	0	0

Table 2: Clinical features and signs.

Variables	No. of cases	%
Symptoms		
Pain in central abdomen	4	20
Pain in right iliac fossa	16	80
Fever	14	70
Vomiting	10	50
Signs		
Right iliac fossa tenderness	20	100
Generalized tenderness	4	20
Rigidity	4	20

Table 3: Ultrasonography-abdomen findings.

USG findings	No. of cases	%	
Diameter	Less than 7 mm	16	80
	Greater than 7 mm	4	20
Perforated appendix	0	0	
Peritonitis	0	0	
Appendicular lump	0	0	

80% patients in our study has appendicular diameter <7 mm, so they required only two 5.5mm trochars, rest 20% required one 11mm and one 5.5mm trochar.

Table 4: Intra-operative complications and conversions.

Complication	No. of cases	%
Bleeding	0	0
Bowel injury	0	0
Conversion to open	2	10
Conversion to 3 port	2	10

In our series 10% cases converted to open surgery and 10% cases converted to standard three port laparoscopic appendectomy after diagnostic laparoscopy depending upon confidence and comfort of surgeon.

In 50% cases surgery was completed in 70 minutes while 30% required 42 minutes. After 48 hours no patients experienced pain in our study. Majority of patients in our series had mild to mod pain during the first 48 hours post operation.

Table 5: Duration of surgery.

Variables	No. of cases	%
Duration (minutes)		
30-60 (mean 42)	6	30
60-90 (mean 70)	10	50
90-120 (mean 100)	4	20
Greater than 120	0	0
Pain (hours)		
Less than 12	0	0
12-24	12	60
24-36	6	30
36-48	2	10
48-72	0	0
Greater than 72	0	0

Table 6: Post-operative pain score (VAS)

VAS score	0-2	2-4	4-6	6-8	8-10
No. of cases	8	8	4	0	0
%	40	40	20	0	0

Table 7: Early post-operative complaints and cosmetic outcome (scar visibility).

Variables	No. of cases	%
Complication		
Pain (generalized)	2	10
Pain (port site)	18	90
Infection	0	0
Paralytic ileus	0	0
Cosmesis		
Visible scar	4	20
Nonvisible scar	16	80

90% cases in our series has port site pain while 10% experience generalized pain. 80% cases in our series has no visible scar while 20% cases have minimally visible scar.

Table 8: Size of trochar used for successful completion of procedure.

Trochar sizes	No. of cases	%
5.5/5.5	16	80
11/5.5	4	20

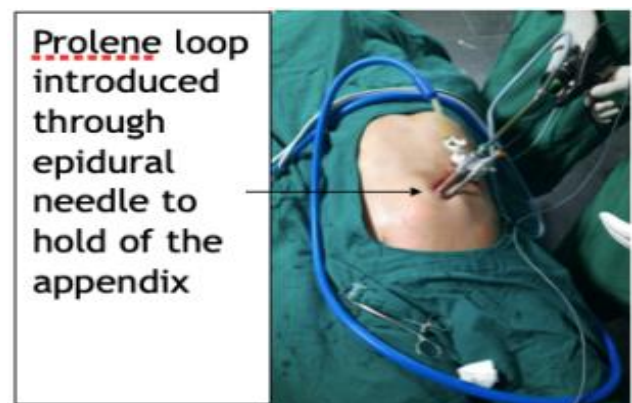
80% cases required two 5.5mm trochar while 20% cases required one 11mm and one 5.5mm trochar. This finding correlates well with our preset criteria of using different trochar sizes depending on the diameter of appendix on USG abdomen.

DISCUSSION

This was a prospective pilot study with 20 patients fulfilling inclusion and exclusion criteria who were admitted in our hospital (SMIMMER, Surat) from a

period of 1st December, 2019 to 1st April 2020. Inclusion criteria consisted of patients diagnosed with acute appendicitis with both clinical and radiological findings indicative of the same while exclusion criteria were patients with chronic appendicitis, gangrenous appendicitis, perforated appendicitis, appendicular lump, appendicular abscess/phlegmon who underwent either open appendectomy or were treated conservatively. Participants included in the study underwent single site two port laparoscopic appendectomy (SSTPLA) after their consent. Demographic and clinical profile, comorbidities, laboratory findings, findings of ultrasonography-abdomen, especially diameter and signs of lump formation and perforation were recorded.

We followed the standard SSTPLA technique in each case with documentation of any conversion to open or standard three port technique. All patients were placed in supine position and general anaesthesia was given. After painting and draping, port sites were marked on the left spino-umbilical line crossing lower and upper edge of umbilicus. Lower marking on umbilical edge is site for first 5.5 mm Trochar, used initially for diagnostic laparoscopy and then for working instrument while upper marking on umbilical edge is used for 2nd trochar (camera port) which can be 5.5/11 mm depending on pre-set criteria according to diameter of appendix. After diagnostic laparoscopy through 1st trochar, having decided to proceed with SSTPLA, other trochar was inserted on the mark made on upper edge of the umbilicus. Upper and lower edges of the umbilicus (diagonally) were chosen as port sites as they provide many advantages like maximum distance for two ports at the umbilicus reducing/avoiding clasping of camera and working instrument and ergonomic ease as well as cosmetic superiority (Figure 1).

**Figure 1: Exact site of port insertion.**

Use of 30 degrees telescope further reduces clashing of camera and working instrument. This technique also allows surgeons one hand to be free which makes it ergonomically beneficial. Port size was kept at 5.5 mm if appendix was <7 mm and 11 mm if appendix was = or >7 mm. Pneumoperitoneum created with veress needle at 1st port site followed by insertion of 5.5 mm trochar.

Peritoneal cavity was thoroughly examined with 5 mm telescope to confirm the diagnosis and assess size of appendix. Second trochar of appropriate size was placed as per our above preset criteria. Loop inside epidural needle (Figure 2) was used to catch hold of the tip of the appendix so as to provide traction for bipolar cautery to easily transect meso-appendix.

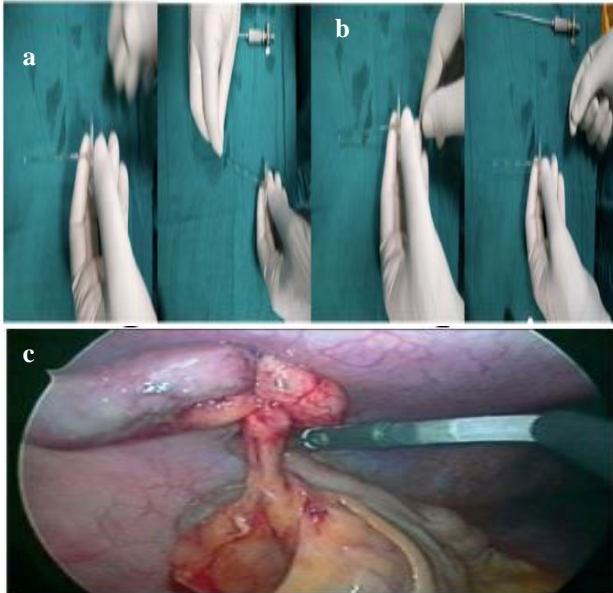


Figure 2: (a and b) Steps for formation of loop inside epidural needle and (c) how proline loop inside epidural needle held the appendix.

A simple 2.0 polypropylene loop was protected inside the epidural needle during the abdominal puncture followed by introduction and advancement of loop to hold appendix before removing the needle. After removing the needle, loop is pulled to secure appendix with abdominal wall (Figure 2b). The epidural needle puncture site did not leave residual scars.

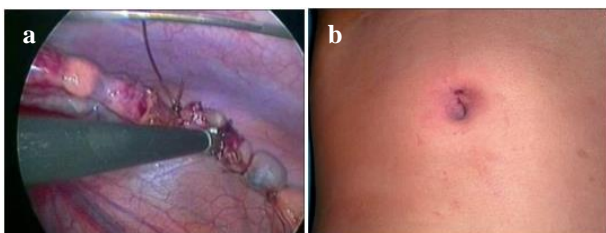


Figure 3: (a) Transection of appendix after ligating its base with endo-loop and (b) one-month follow-up, no scar visible.

After sequentially cauterizing and dividing mesoappendix with bipolar cautery from tip to the base, remaining close to the appendix, the base of appendix was ligated via a preformed endo-loop made of chromic catgut no.1 followed by transection for removal (Figure 3a).

Retrieval of specimen is done through 10 mm or 5 mm port depending on size. On one-month follow-up after the procedure, no scar was visible (Figure 3b).

SILA can be described as minimally access surgery with the benefit of better cosmetic outcome. The skin incisions were almost hidden after surgery and most patients expressed satisfaction with the virtually scarless outcome.¹¹ SILA is being referred to as scarless surgery. In addition, the expectation is that a reduction in the number of surgical incisions will correlate to both a decline in incisional complications like infections, hernias, and haematoma, as well as a decrease in adhesion formation and improvement in patient convalescence.^{12,13}

In our technique we started by inserting the laparoscope through 5.5 mm Trochar via a 5 mm incision for diagnostic laparoscopy with pneumoperitoneum set at 12 mm of Hg for confirmation of the diagnosis and to decide whether to continue with the same or for the need to convert it to open or three port. In 2 out of 20 cases diagnostic laparoscopy was suggestive of severe bowel adhesions to each other as well as to the abdominal wall which made it impossible for the surgeon to get hold of the appendix. Hence, these cases had to be converted to open appendectomy which made the total operative time of greater than one hour. It was found that these two cases were those which had generalized tenderness and experienced rigidity and had appendicular tip diameter of greater than 7 mm. Both of these cases belonged to the age group of 41 to 50 years and both of them were males. Both the cases experienced post op pain of greater than 36 to 48 hrs of 4-6 VAS score which made their hospital stay of greater than 2 days. These were the patients who were not satisfied with their cosmetic result after surgery. In other 2 out of 20 cases diagnostic laparoscopy was suggestive of severely inflamed adherent appendix which had to be converted to the conventional three port laparoscopic appendectomy.

It was found that these two cases were those which had generalized tenderness with rigidity and had appendicular diameter of greater than 7 mm. Both of these cases belonged to the age group of 41 to 50 years and both of them were males. Both the cases experienced post op pain of greater than 24 to 36 hours of 4-6 VAS score which made their hospital stay of greater than 2 days. These were the patients who were not satisfied with their cosmetic result after surgery. All the rest 16 cases underwent single sight two port laparoscopic appendectomy. All the 16 cases presented with RIF tenderness with sonographic findings of appendix tip diameter to be less than 7 mm. all of them were below 40 years and most of them were males. They experienced a post op pain of less than 24 hours as compared to greater than 24hrs in other techniques. The intensity of pain was under 4 VAS score which made their hospital stay of less than 2 days. These patients were completely satisfied

with the cosmetic outcome. On follow up after 1-month post-surgery, there was hardly any visible scar.

More recently, we have noticed publications interested in the concept of minimally invasive appendectomy. In 2007, Penait et al published a series of eight patients also treated with two access ports, but with differences in relation to our technique, i.e. trocar sizes, positioning and appendicular fixation (accomplished by a suture in the anterior abdominal wall with a pre-formed endo-loop and used as a pulley).¹⁴ In another series the fixation was done through a trans parietal suture in the right iliac fossa, which also transfixes the mesoappendix.¹⁵

CONCLUSION

From the above study we conclude that this new technique of single sight two port laparoscopic appendectomy is technically safe and feasible. It provides excellent cosmetic outcome as it hardly leaves any visible scar at operative site. Our experience of this innovative surgical technique is suggestive of the fact that SSTPLA has better patient satisfaction with respect to cosmesis, decreased post-operative pain, decreased hospital stay, decreased operative time, fewer intra op and post op complications and surgeon satisfaction with respect to ergonomics and decreased chances of collision of laparoscope with only single working instrument. The option of converting SSTPLA to open or conventional three port laparoscopic appendectomy or open surgery is always open in complicated appendicitis however careful patient selection and segregation will avoid the need to do so.

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Ethical approval: Not required

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