

## SURGICAL SITE INFECTION (SSI) IN OPEN VS LAPAROSCOPIC APPENDICECTOMY IN CASE OF COMPLICATED APPENDICITIS: A RETROSPECTIVE STUDY

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### Summary

*Appendicectomy is one of the most common surgical procedures in day to day practice in Bangladesh. Although it is considered a safe operation, a potential complication developed in complicated appendicitis. Surgical site infection is one of those noticeable complications. Infection of wound still remains one of the main postoperative morbidities and as a result, prolonged hospitalization in those undergoing open appendicectomy(OA).Laparoscopic appendectomy (LA) has been widely practiced for uncomplicated appendicitis.The role of laparoscopy in management of complicated appendicitis remains undefined. Complicated appendicitis is associated with a significant risk of postoperative morbidity, making the value of the minimally invasive approach is superior.*

*This is a retrospective study comparing SSI in laparoscopic appendicectomy versus open appendicectomy. The study was performed on 120 patients which were clinically and after investigation diagnosed as a case of complicated appendicitis from January 2008 to June 2011. Out of them 60 patient were done by laparoscopically and 60 patients by open method. Complicated appendicitis includes perforated appendicitis, gangrenous appendicitis and appendicular abscess or early lump found intra-operatively. Patients were excluded if the diagnosis of appendicitis was not clinically established and if they had a history of symptoms for more than 5 days and/or a palpable mass in the right lower quadrant.*

*The conversion rate, operative time, SSI (postoperative abdominal and wound infections), the return to oral intake, and the length of hospitalization were analyzed .The aim of this study is to compare the SSI between LA and OA for complicated appendicitis.*

*In 60 patients of laparoscopic appendectomy for complicated appendicitis there were 35 patients with perforated appendicitis, 12 patients with gangrenous appendicitis and 13 patients with early appendicular lump or abscess. There were 42 males and 18 females, mean age 24 yrs (range, 18 to 32), The average operating time was 65 minutes. The average length of hospitalization was 3.2(2-5) days. The post operative narcotic analgesic requirement was minimal. Laparoscopy was converted to open surgery in two patients (3.33%). Four (6.6%) had post operative complications (diarrhea). Nine patients developed (15.00%) developed wound (port) infection. SSI . No statistically significant differences in operative time (P0.13) There was no mortality in the current series.*

*Laparoscopic appendectomy is a safe and feasible treatment option in complicated appendicitis. It is advantageous than open surgery because of less wound infection, less morbidity, less hospital stay and early return to work and not associated with increased risk of septic postoperative complications.*

### Key Words

Laparoscopic appendectomy; complicated appendicitis; SSI

### Introduction

Laparoscopic appendectomy for a non-inflamed appendix was first reported in 1983 by the gynecologist Semm [1]. In 1987 Schreiber reported a laparoscopic assisted appendectomy for the treatment of acute appendicitis [2]. Open appendectomy (OA) has withstood the test of time for more than a century since its introduction by McBurney [3], lifetime risk of appendicitis is 6%. For decades, Open appendectomy has been the standard treatment for all forms of appendicitis with excellent results. The overall mortality of OA is around 0.3%; and morbidity, about 11% [4].

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Numerous prospective randomized studies,[5-7] meta-analyses [8-10] and systematic critical reviews [9] have been published on the topic of LA, with a general consensus that the heterogeneity of the measured variables and other weaknesses in the methodology have not allowed to draw definitive conclusions and generalizations [11].

Complicated appendicitis may be defined by perforation with purulent peritoneal collection, abscess formation, and early appendicular lump comprises 20% to 30% of all cases of appendicitis. It has been associated with a significant risk of postoperative septic complications, including wound infections and intraabdominal abscess formation [12,13]. Postoperative infection, abscess and sepsis in modern surgery continues to be a significant problem for healthcare practitioners across the globe. SSI are a real risk associated with any surgical procedure and represents a significant burden in terms of patients morbidity, mortality and cost to health service. The feasibility and validity of the laparoscopic approach has caused significant controversy mainly due to early reports of the increased incidence of intraabdominal abscess rates [14-18]. Conversely, several more recent trials [19-23] have found a statistically significant reduction in postoperative complications with the laparoscopic approach to the point that it has actually been proposed as the method of choice for complicated appendicitis.

#### **Material and methods**

A retrospective analysis was performed in Chittagong Medical College Hospital and various Private hospitals in Chittagong from January 2008 to January 2011. This study was undertaken with the aims & objectives to compare the SSI after LA and OA for complicated appendicitis in terms of erythema at operation site, serous discharge, purulent exudates, wound gap and burst abdomen and to evaluate whether laparoscopic operation is better than conventional operation in terms of benefits of minimal invasive surgery

These patients were further classified into 3 groups according to operative findings: Group 1- perforated appendicitis, Group 2-gangrenous appendicitis, and Group 3-appendicular abscess or lump.

Patient included in this study which was clinically and after investigation (Leukocytosis above 10,000 cells per mL, Ultrasonography shows-Swollen oedematous appendix with free fluid collection or gangrenous appendicitis) diagnosed as a case of complicated appendicitis, Age>14 years and ASA score <II.

Patients were excluded if the diagnosis of appendicitis was not clinically established, if they had a history of symptoms for more than 5 days and/or a palpable mass in the right lower quadrant, Age <14 years, ASA score >II and previous lower abdominal surgery.

#### **Surgical Technique**

Laparoscopic operative technique included the insertion of standard 3port technique. More specifically, after the induction of general anaesthesia, pneumoperitoneum was accomplished with the introduction of a 10-mm trocar with the open technique at the umbilicus. A 5-mm trocar was then inserted at the right iliac fossa, and finally a 10-mm trocar was inserted at the left iliac fossa. Initially diagnostic laparoscopy was undertaken to see any purulent exudates, pus or any lump in the appendix region. If any pus or exudates, suction was given to clear the abdomen. Then with a Trendelenberg position and a modest right up tilt of the table the right iliac fossa was explored further. The status of the appendix was ascertained at this stage and care to be taken to avoid avulsion of a friable or gangrenous appendix from its base. The mesoappendix is divided by using of an endoclip. The base of the appendix was ligated by using vicryl 2(0) or endoclip. Copious amounts of saline were used for peritoneal lavage. Drains were used in all cases. A surgical glove was used as an endobag for retrieval of appendix thus avoiding port site contamination.

#### **Postoperative Care**

Analgesics were given regularly during the hospital stay, and a clear liquid diet was instituted after the first 24 hours with gradual advancement according to bowel movements. Antibiotic administration (Ceftriaxone, Metronidazole and occasionally Amicasin- intravenous+oral) was given for 7 days in most patients and for 10 days in a few patients.

#### **Statistical Analysis**

The medical records of the patients in the 3 groups were reviewed and compared regarding SSI, conversion rate, operative time, mean hospital stay, mean time of return of oral intake by using the chi<sup>2</sup> test and the Wilcoxon rank sum test. Statistical significance was reached at P<0.05.

#### **Results**

A total of one hundred and twenty patients, Sixty patients are in LA group and sixty are in OA group. Patients data regarding demographic, clinicopathologic subgroupings are presented in Table I & II, different variable in table III and SSI in table IV.

There was no statistically significant difference in operative time among the 3 groups. Conversion to open appendectomy was needed in 2 patients (3.33): the first patient had an inseparable appendicular lump (considered as Group 3 patient), whereas, the second patient (Group 1) exhibited major technical difficulties mainly due to perforation of at the base appendix and slough out of portion of caecum.

Controversy remains regarding which approach is better, laparoscopic appendectomy (LA) or open appendectomy (OA). A 3-year retrospective review of patients undergoing appendectomy for complicated appendicitis was performed to compare the outcomes and SSI of LA and OA using standard statistical methods ( $P < 0.05$ ). LA was performed in 60 and OA in 60 patients (conversion 3.33%). LA patients were younger (24 years vs 28.5 years), with no differences in body mass index (BMI) ( $24.5 \text{ kg/m}^2$  vs  $22.8 \text{ kg/m}^2$ ) or operative times (65 minutes vs 60 minutes;  $P = 0.84$ ). LA patients required less analgesics Diarrhoea (04 vs 10) and shorter hospital stays. Complications (SSI-erythema, serous discharge, purulent discharge, wound gap, burst abdomen) were significant difference between LA and OA (15% vs 35%;  $P = 0.12$ ). Converted patients were required more analgesia, and had higher morbidity and length of hospital stay. No statistically significant differences occurred in operative time ( $P = 0.13$ ). There was no mortality in the current series. So LA is the procedure of choice for appendicitis regardless of age, sex, BMI, or degree of appendiceal inflammation. LA is as safe and quick to perform as OA with lower analgesic requirements, length of stay.

**Table I :** Patient Demographic

S. No	Demographic	Mean	
		LA	OA
1	Age	24 years	28.5 years
2	Sex	M-42,F-18	M-48,F-12
3	BMI	24.5 kg/sq.m	22.8 kg/ sq.m

Patient Demographic shows that mean age distribution is 24 years and 42, female 18.

**Table II:** Categorization of Complicated Appendicitis

GROUP	TYPE	NUMBER	
		LA	OA
1	Perforated appendix	35(58.34%)	32(53.33%)
2	Gangrenous appendix	12(20%)	16(26.67%)
3	Appendicular lump or abscess	13(21.66%)	12(20%)
4	Complicated appendicitis	60(100%)	60(100%)

Among the 60 patients of complicated appendicitis there were 35 patients with perforated appendicitis, 12 patients with gangrenous appendicitis and 13 patients with early appendicular lump or abscess.

**Table III :** Different Variable Considered

S. No	Variable	Result	
		LA	OA
1	Operative time	65 min	60 min
2	Time to liquid	24 hour after	48 hours after
3	Parenteral analgesic	24 hours	48 hours
	Oral analgesic	6 days	10 days
4	Conversion	2(3.3%)	Nil
5	Diarrhoea	4(6.6%)	10
6	Mean hospital stay	3.2 (2-5) days	10 days

The average operating time was 65 minutes. The average length of hospitalization was 3.2(2-5) days. The post operative narcotic analgesic requirement was minimal. Laparoscopy was converted to open surgery in two patients (3.38%). Four (6.6%) had post operative complications (diarrhoea). No statistically significant differences in operative time ( $P = 0.13$ ).

**Table IV :** Surgical Site Infection(SSI)

S. No	Variable	Result	
		LA (Port site)	OA
1	Erythema at operated site	03	07
2	Serous discharge	02	05
3	Purulent exudates	04	11
4	Wound gap	Nil	08
5	Burst abdomen	Nil	04

## Discussion

The advantages of laparoscopic surgery are now well established. The technique is being applied to expanding number of surgical procedures. Laparoscopic appendectomy has now gained a uniformly favourable reputation. Several meta analyses and comparative studies, however, have shown that it retains the traditional advantages of the minimally invasive approach in terms of decreased wound pain, shorter length of hospital stay, lesser incidence of wound infection (SSI), quicker return to work, and improved cosmesis [24-26].

Our series demonstrates the feasibility and safety of the laparoscopic approach in complicated appendicitis. Postoperative septic complications were absent, and the convalescence for the whole series was excellent.



A few clinical studies on laparoscopic appendectomy for complicated appendicitis have actually raised some serious questions [25]. Early reports have shown an increase in postoperative intraabdominal abscess for burst or perforated appendicitis using the laparoscopic technique. Establishment of pneumoperitoneum in a septic environment has been implicated; however, the effect of pneumoperitoneum on animal models regarding bacterial translocation has had controversial results. Surgical learning curve issues and increased manipulation of the appendix have also been implicated [27].

This series demonstrates results consistent with the latter: there was not a single septic complication (intraabdominal abscess) in any group.

A noteworthy feature of this series is that no statistically significant differences occurred in operative time and postoperative convalescence between the groups. This finding implies that the laparoscopic approach achieves similar results regardless of the type of complicated appendicitis. The magnification offered by the laparoscopic view, the minimal manipulation of the peritoneal cavity contents and of the appendix and the ability to gain access to and thoroughly irrigate every intraperitoneal space and significant reduction of SSI contributes to the superiority of the minimally invasive approach over open surgery [28,29].

However, all laparoscopic appendectomies were performed by surgeons with learning curves well past the accreditation requirements. Additionally the same experienced nursing team supported the majority of these operations. We do feel that both played a key role in achieving these excellent clinical results.

Outstanding cosmesis proved to be another highly appreciated feature for our patient that compliments the success of laparoscopic surgery in these complicated cases.

### Conclusion

To conclude in a nutshell, laparoscopic appendectomy is an attractive and superior alternative to conventional surgery. Laparoscopic management of acute appendicitis appears to have multiple advantages. Supporters of Laparoscopic Appendectomy claim that laparoscopy allows full evaluation of the abdomen and improves diagnostic accuracy.

Our series demonstrates the feasibility and safety of the laparoscopic approach and compare the SSI in complicated appendicitis. Laparoscopic appendectomy is a safe and feasible treatment option in complicated appendicitis. It is advantageous than open surgery because of less wound infection, less morbidity, less hospital stay and early return to work and not associated with increased risk of septic postoperative complications.

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### Disclosure

All the authors declared no competing interest.

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