



PREVALENCE OF SURGICAL SITE INFECTION AFTER APPENDECTOMY: A NON RANDOMIZED CONTROLLED TRIAL STUDY

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Conflicts of Interest: Nil

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Abstract:

Background: Objective: to find the overall prevalence of SSI after appendectomies and which treatment option faced more SSI incidence.

Design: non randomized controlled trail

Setting and patients: This present study included 250 cases diagnosed as appendicitis and operated on at surgical unit 3, Lahore General Hospital

Intervention(s): patients underwent either laparoscopic or open appendectomy (OA) at surgical unit 3, Lahore General Hospital September 1, 2017 to April, 2019

Main Outcome Measure(s): prevalence of SSI

Result: Appendectomies were performed openly in 180 patients (OA group) and laparoscopically in 120 patients (LA group). The mean patient age was 30.7 ± 8.4 years, with 180 men and 120 women. And body mass index (BMI) was higher significantly in the LA group than in the OA group. The overall SSI rate was different between the two groups (2.8% for the LA group vs. 11.11% for the OA group, respectively, $P=0.204$), but the superficial SSI rate was significantly lower in the LA group as compared to OA group (8.8% vs. 1.6%, $P = 0.016$).

Conclusion: The overall SSI prevalence after appendectomies is high. But the rate is more seen in patients with OA as compared to LA. In addition superficial SSI is more common type of infection in both groups.

Keywords: Laparoscopic, Appendectomy, Surgical-site infection

Introduction

Defined as an acute inflammation of the appendix, acute appendicitis is the most frequent aetiology of acute surgical abdominal pain in developed countries.¹ Its currently approved standard of treatment is appendectomy.^{2,3} In the USA, the annual number of people undergoing appendectomy in acute care hospital is estimated at 300 000.⁴⁻⁶ Appendectomy can be performed through a laparoscopic or an open surgery technique, with laparoscopy being the most recommended method.⁷⁻¹⁰ This is because the former is associated with reduced postoperative pain, a short length of hospital stay with a subsequent earlier return to day-to-day activities, reduced postoperative ileus and better cosmetic results.⁷⁻¹⁰ Within the last five decades, the mortality associated with acute appendicitis has drastically dropped from 26% to less than 1%.^{11,12} Appendectomy can also lead to other several postoperative complications like all surgical procedure these can be pelvic or abdominal abscess

and surgical site infections (SSI) persistent ileus, cecal fistula.¹³

prolonged postoperative morbidity is associated with SSIs, which is a substantial additional healthcare cost, making this complication bother for all surgical teams.^{14,15} In Brazil few studies conducted, Sweden, China and the USA report SSI prevalence rates of 7.2%, 5.9%, 6.2% and 2.9%, respectively, after appendectomy.¹⁶

Moreover, a recent systematic review on SSIs after appendectomy was conducted in low and middle Human Development Index countries (LMHDICs)¹⁷ and results stated a high prevalence rate of SSI was reported in LMHDICs as compared with studies conducted in high Human Development Index countries,

Despite the increasing number of appendectomies done in the Pakistan. The aim of study to find out the Prevalence of SSI after appendectomy.

Method

This present study included 250 cases diagnosed as appendicitis and operated on at surgical unit 3, Lahore General Hospital (n=250) from September 1, 2017 to April, 2019. The subjects consisted of 130 males and 120 females, and their mean age was 33.32 ± 20.80 years. All patients diagnosed with acute appendicitis and who underwent appendectomy were included in the study. For the diagnosis of appendicitis the clinical picture, laboratory and radiological findings suggestive of acute inflammation of the appendix were considered. Patients with appendicular mass (history > 5days, palpable mass on physical examination, or found at Ultrasonography), associated pregnancy, those not fit for surgery, with chronic medical conditions like CLD, coagulation disorders, those incapable of providing informed consent were excluded .

The severity of illness (hyperemia, suppuration, gangrene/perforation, or abscess formation) was determined through the final pathologic reports. Each patient's medical records were reviewed in terms of operation time, time to the start of a normal diet, length of hospital stay, postoperative complications (wound, abscess, ileus, etc), and readmission within 30 days of surgery.

Center of Disease Control guideline was defined the definition of SSI. Fascia abscess and intra-abdominal abscess were reclassified as deep incisional SSI and organ/space SSI, respectively [17].For each patient, the National Nosocomial Infection Surveillance (NNIS) system risk index was computed on the basis of an ASA. If the score of ASA higher than two, it indicated the contaminated or dirty/infected class of wound, and > 81 minutes of the duration of procedure, with each criterion met adding one point to the index. Additional demographic information was taken that included age, sex, smoking habits, diabetes mellitus status, and body mass index. The surveillance

procedure included the diagnosis of SSI within 30 days of surgery, whether during hospitalization or after discharge. Patient confidentiality was protected by the infection control staff who coded all data.

Statistical analyses

Analysis was performed using SPSS, and Student's t-test or Pearson's chi-square test was used. A P-value of <0.05 was considered to be statistically significant. Relative risk ratios (RR), 95% confidence intervals (CI), and p-values were determined.

Results

Appendectomies were performed openly in 180 patients (OA group) and laparoscopically in 120 patients (LA group). The mean patient age was 30.7 ± 8.4 years, with 180 men and 120 women. And body mass index (BMI) was higher significantly in the LA group than in the OA group, Active smokers most frequently had SSIs (RR 2.21; 95% CI 0.92–5.29; $p = 0.060$). Diabetes mellitus and obesity were found in 58 patients and out of them 3 of patients with SSIs ($p > 0.050$).But the other demographic and pathologic parameters were not significantly different between the two groups (Table 1).

The mean operation time was longer by 15 minutes in the LA group than in the OA group (75.93 ± 31.55 minutes vs. 60.14 ± 33.55 minutes, $P = 0.017$). But the length of hospital stay was significantly shorter in the LA group than in the OA group (3.37 ± 0.12 days vs. 3.83 ± 0.12 days, $P = 0.006$. moreover The overall SSI rate was different between the two groups (2.8% for the LA group vs. 11.11% for the OA group, respectively, $P=0.204$), but the superficial SSI rate was significantly lower in the LA group as compared to OA group (8.8% vs. 1.6%, $P = 0.016$).Nine patient had deep incisional with OA and 3 patients experienced deep pain with LA. And organ space SSI was seen same in both groups. (Table 2)

Table 1: Patient demographics and SSI

	Total	Surgical site infection	
		Yes n = 38	No n = 212
Age, mean \pm SD, years Sex	30.7 \pm 8.4	30.5 \pm 9.0	30.7 \pm 8.3
Male	180	22 (12%)	158 (88%)
Female	70	16 (23%)	54 (77%)
Active tobacco use	98	7 (7.1)	91 (92.9)
Diabetes mellitus	45	5 (11%)	40 (89%)
Obesity (BMI \geq 30 kg/m ²)	58	3	55

ASA score			
1,2	241	21 (8.7)	573 (91.3)
3,4	9	1 (11.1)	8 (88.8)
Type of procedure			
Laparoscopic	120	9 (7.5)	111 (92.5)
Open	180	29 (16.1)*	151(83.8)

Table 2: Surgical-site infections in overall appendicitis and postoperative characteristic

	OA (n = 180)	LA (n = 120)	P-value
Superficial incisional	16 (8.8)	2 (1.6)	0.016
Deep incisional	9(5)	3 (2.5)	0.978
Organ/space	4 (2.2)	4 (3.3)	0.228
Overall SSI	20 (11.11)	9 (7.5)	0.204
Operation time (min)	60.14 ± 33.55	75.93 ± 31.55	0.07
Length of hospital stay (day)	3.83 ± 2.41	3.37 ± 2.17	0.006
Readmission within 30 days	9	2	0.01

Values are presented as mean ± SD, no. of cases (%) or %. OA, open appendectomy; LA, laparoscopic appendectomy; BMI, body mass index.

Discussion

Laparoscopic surgery allows for safe and aesthetic operation¹⁸⁻²⁰ and it is also known to accelerate postoperative recovery and to produce less pain²¹. In the previous study, the time to the first flatus after surgery was not significantly different between the two groups. The reason for this may be that the appendectomy is such a minor operative procedure that the recovery of gastrointestinal motility is not significantly affected. However, in current study the length of hospital stay was significantly shorter in the LA group. The mean age of the patients was significantly younger. This may be explained by the fact that young people are usually more concerned about aesthetic outcomes.

In previous literature the frequency of LA was significantly higher in females aged <25 years than in those aged ≥25 years (19% [60/318 cases] vs. 12% [51/431 cases], P = 0.007), which suggests that young patients favored the minimally invasive operation. But in current data the Operation time was significantly longer in the LA group than in the OA group.

Khan et al.²² reported that the median operation time was 51.3 minutes in the LA group and 40.6 minutes in the OA group. Bennett et al.²³ showed similar results based on a meta-analysis of 22 studies. Due to additional time needed for the preparation of the laparoscopic equipment, so the LA operation time

is longer as compared to OA. And a steep learning curve for the laparoscopic procedure when performed by a novice. This time of operation could be shorten if a novice overcomes the learning curve and becomes familiar with the laparoscopic procedure. As longer hospital stays are prone to cause SSI. BMI was documented significantly higher in the LA group in comparison to the OA group. Obesity is known to be a risk factor for surgical-site infection and BMI is used to define obesity. Higher BMI tends to correlate with higher SSI rate²⁴.

However, in the present study, the overall SSI rate was significantly different between the two groups, and the superficial SSI rate was rather significantly lower in the LA group. In both the LA and OA groups the SSI can effect anywhere from skin to organ. However, due to modern technology and unique nature of the laparoscopic procedure the rate of skin SSI is low in LA group.

Shalak et al.²⁵ mentioned systematic extraction of grossly infected appendices with a bag. in the LA group The extraction bag (Lap-bag, Sejong Medical, Paju, Korea) was used in all cases to avoid the surgical wounds to direct contact with the infected appendices or inflamed tissues around the appendices. On the other hand, the wounds are vulnerable to the infections or inflammations in the OA group. When laparoscopic surgeons manipulate lesions inside the abdominal cavity, the bag decreases the risk of superficial SSI by keeping the skin or subcutaneous tissue a safe distance from the lesions. However, organ/space SSI incidence was higher in the LA group than in the OA group (3 cases

[1.1%] vs. 2 cases [0.6%]), although the difference was not statistically significant. This finding leads to a concern about the possibility of complications of LA such as intra-abdominal abscess, as mentioned in previous studies^{9, 10, 20, 21]}

Markides *et al.*²⁶ also emphasized the surgeon's discretion and laparoscopic experience in complicated appendicitis, while concluding no difference with regard to intra-abdominal abscess complication rates (level 3a evidence) in their systematic review and meta-analysis. Therefore, when LA is conducted, the surrounding area of the pelvis should be carefully explored. Abscess should be sufficiently aspirated or the insertion of drains should be considered. The current study has some limitations in that the enrolled patients were not randomized to the OA and LA groups. Our patients underwent operation by several surgeons with varying degrees of surgical skills. To remove these limitations, well-designed randomized controlled trials with a larger number of patients should be carried out. However, due to the continued growth of the popularity of LA such trails would be impossible practically as mentioned previously¹⁸.

Factors related to SSIs in the patient population included smoking, complicated appendectomies (e.g., gangrenous, perforated), and those performed by open procedures. These variable have been mentioned in other previous publications.^{8-11, 17}. An analysis of NHSN data (2006–2008) reported male sex (odds ratio 1.70; 95% CI 1.07–2.68) as a risk factor for SSI in appendectomy, which is not consistent with our findings.²⁷ this is probably related to the gender distribution in our patients and the population living in the country.

Conclusion

The overall SSI prevalence after appendectomies is high. But the rate is more seen in patients with OA as compared to LA. In addition superficial SSI is more common type of infection in both groups.

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