

# Surgical Site Infection in Open Versus Laparoscopic Appendectomy

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## ABSTRACT

**Objective** To compare the rate of surgical site infection (SSI) in patients undergoing open and laparoscopic appendectomy.

**Study design** Randomised controlled trial.

**Place & Duration of study** Surgical "A" unit, Department of Surgery Khyber Teaching Hospital Peshawar, from March 2008 to February 2011.

**Methodology** Patients with signs and symptoms suggestive of acute appendicitis were randomly allocated into two groups, A and B. Group A patients were subjected to open appendectomy (OA) and Group B to laparoscopic appendectomy (LA). Patients demographics including age, gender and wound infection in terms of SSI were recorded on a proforma. Statistical analysis was performed using SPSS version 11 with proportions and mean  $\pm$  SD calculated for categorical and continuous variables, respectively. Probability = 0.05 was taken as significant.

**Results** Two hundred and ninety two patients were analyzed (146 in group A and 146 in group B). The mean age of patients in group A was  $26.5 \pm 7.1$  year and  $25.2 \pm 6.5$  year in group B. The male to female ratio in group A was 1.21:1 compared to 1.28:1 in group B. Surgical site infection was observed in 10 patients in group A and in 6 patients in group B. There was no significant difference between the two procedures regarding overall SSI rate ( $p=0.304$ ).

**Conclusion** Laparoscopic appendectomy did not offer significant advantage over open appendectomy in terms of SSI.

**Key words** Surgical Site Infection, Appendectomy, Wound infection.

## INTRODUCTION:

The incidence of appendicitis is higher in males with a peak age between 15-25years but can affect all age groups with 5-10% lifetime risk. Acute appendicitis has been the most commonly encountered emergency procedure in surgical practice across the world.<sup>1</sup> OA has been the treatment of choice for acute appendicitis since its first description by McBurney in 1894.<sup>2</sup> LA was introduced in 1983. Since then a consensus cannot be arrived at as to what should

be the ideal surgical approach for appendectomy.<sup>3</sup>

SSI is the most common postoperative complication occurring in 5-10% of all patients.<sup>1</sup> Most of SSI (60%) are diagnosed after hospital discharge. SSI can lead to clinical problems like increased hospital stay and adds to cost of treatment.<sup>4</sup> According to Cochrane systematic review, SSI are 50% as less after LA as after OA. In contrast the incidence of intra-abdominal infections are common (almost 3 times) in LA.<sup>5</sup> The impact of laparoscopy on SSI is not addressed well in the surgical literature.<sup>6</sup>

In contrast to simple appendicitis, some surgeons feel resistant to embark on LA in complicated appendicitis for the fear of increasing the rate of organ space SSI.<sup>7</sup> There are however, others who

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disagree with the fact that LA is associated with an increased incidence of SSI.<sup>8</sup> Keeping in mind, the conflict of opinion that exists thus far regarding surgical site infection between LA and OA, and scarcity of locally published studies on this issue, we aimed to undertake a study to compare the LA and OA in terms of surgical site infection, thereby, decreasing morbidity of the patients due to SSI by instituting measures in light of results of the present study.

#### **METHODOLOGY:**

A randomized clinical trial was conducted at Surgical 'A' Unit, Department of Surgery, Khyber Teaching Hospital Peshawar, from March 2008 to February 2011 after taking approval of ethical committee. Based on current literature findings, we hypothesized that there was no significant difference between OA and LA in terms of surgical site infection.

In this study, a total of 292 consecutive patients presenting with signs and symptoms suggestive of acute appendicitis, aged between 12 to 50 year, and with American Society of Anesthesiologists class I, were included. Patients with gangrenous or perforated appendix, pus in the peritoneal cavity, previous abdominal surgery, large ventral hernia, mass right iliac fossa and failing to abide by the follow up protocol, were excluded. All the patients were selected through non-probability consecutive sampling technique, after explaining the risks and benefits of both the procedures and taking an informed written consent regarding participation in the trial.

Patients were randomly allocated into two groups, A and B, using table of random numbers just before the operation. The patients in group A were subjected to OA and group B to LA. The patients in both the groups were operated by a consultant surgeon under general anesthesia. Skin preparation was done with povidine iodine solution. All patients received prophylactic parenteral dose of cefuroxime and metronidazole at induction.

OA was performed through grid iron incision. Appendix was identified and the mesoappendix was ligated. The base of the appendix was crushed and ligated using polyglycolic (Vicryl) 1 and removed. The wound was closed in layers. LA was performed through a 3 port technique with carbon dioxide used for creation of pneumoperitoneum through a 10mm infra-umbilical port. After identification of the appendix the mesoappendix was ligated, with vicryl 1 after creation of a window in its base, and cut. The base of the appendix was crushed and ligated

using polyglycolic (Vicryl) 1 endoloop. The appendiceal specimen was retrieved through a 10 mm infra-umbilical port. Endodiathermy was used for hemostasis. Skin incision in both the procedures was closed with continuous subcuticular stitches using polypropylene 2/0 suture. Port (LA) and wound sites (OA) were dressed.

SSI was defined, using center for disease control and prevention (CDC) classification, as incisional and deep SSI. Incisional SSI was further divided into superficial and deep with involvement of superficial subcutaneous tissue and deep subcutaneous tissue and muscles, respectively. The findings/features of purulent or seropurulent discharge, redness or pain, at the incision site within 10 days postoperatively were used to identify SSI. A febrile patient with fever, elevated white cell count (WBC >10,000g/dl), paralytic ileus and imaging detected fluid collection with characteristics of an abscess were labeled as having intra-abdominal abscess.

The data was analyzed with the help of computer software SPSS for windows version 11.0. Age was presented as mean and standard deviation. Gender distribution was described in percentages. Proportions of patients with surgical site infection in Group A and B was recorded in tabular form and both the groups were compared using Chi-square test. P value of = 0.05 was considered significant.

#### **RESULTS:**

In this study 292 patients were included, 146 patients in group A, who underwent OA and 146 patients in group B who underwent LA. The mean age of patients in group A and group B were  $26.5 \pm 7.1$  year and  $25.2 \pm 6.5$  year respectively and it was statistically not significant ( $p = 0.101$ ). Most of the patients were in the age range of 21-30 year, 83 (56.9%) patients in Group A and 80 (54.8%) patients in Group B (table I). There were 80 (54.8%) males and 66 (45.2%) females in Group A with male to female ratio of 1.21 : 1 compared to 82 (56.2%) males and 64 (43.8%) females in Group B with a male and female ratio of 1.28 : 1.

Surgical site infection was observed in 10 patients in Group A and in 6 patients in Group B which was statistically not significant ( $p = 0.304$ ). Out of 10 patients who developed SSI in OA group, there were 8 (80%) cases of incisional and 2 (20%) cases of deep SSI. In contrast, the corresponding figures in OA group were 3 (50%) and 3 (50%) respectively.

**Table I: Age Distribution**

Age Range (year)	Group A n (%)	Group B n (%)	Total n (%)
11-20	20 (13.7)	34 (23.3)	54 (18.5)
21-30	83 (56.9)	80 (54.8)	163 (55.8)
31-40	32 (21.9)	27 (18.5)	59 (20.2)
41-50	11 (7.5)	05 (3.4)	16 (5.5)
Total	146 (100)	146 (100)	292 (100)

**DISCUSSION:**

Surgical site infections are a major source of postoperative morbidity. They along with urinary tract infections, pneumonia and blood borne infections, ranked as the second or third most common type of hospital acquired infections.<sup>9</sup> Almost no surgical procedure is free of the risk of surgical site infection despite advances in surgical techniques, use of antibiotic prophylaxis and efforts to control infection.<sup>10</sup> Acute appendicitis can occur at any age however maximum number of patients are seen in 2<sup>nd</sup> and 3<sup>rd</sup> decade of life. Male to female ratio in our study was marginally higher in males as compared with other study.<sup>11</sup>

Laparoscopic appendectomy, in contrast to laparoscopic cholecystectomy, has not documented its superiority over OA as yet.<sup>12</sup> A meta-analysis of prospective randomized trials, comparing LA and OA, found significant difference between the two modalities in terms of SSI.<sup>13</sup> Others, however, failed to reproduce these results.<sup>14</sup> The findings of the current study showed statistically insignificant difference of SSI between the groups. The rate of incisional SSI was not statistically significant between the two groups either. These figures are in accordance with other studies.<sup>15,16</sup> All cases of incisional SSI were treated with opening of wound, toilet, povidine iodine packing and oral antibiotics with an uneventful recovery.

On further stratifying SSI, we found that there was no statistically significant difference between the two groups in terms of deep (organ-space) SSI, 2/146 for OA and 3/146 for LA. All the deep infections (in both the groups) occurred in patients with perforated appendicitis. Others have reported significantly increased incidence of intra-abdominal abscess in complicated appendicitis in LA as compared to OA.<sup>12,17</sup> The patients with organ space SSI, in this study, were diagnosed using ultrasonography and were managed conservatively with parenteral antibiotics and drainage under radiological guidance.

Surgical site infection has been traditionally used to compare the two modalities of treatments for acute appendicitis. It may not be a serious complication on its own but may hamper patients' convalescence time and quality of life with the deep SSI proving to be life threatening in many patients.<sup>15</sup> Some believe that intra-abdominal abscess can be reduced specially in LA if, the patient is placed in Trendelenburg position, sigmoid colon is retracted and the pelvis is completely irrigated and aspirated.<sup>18</sup> However debate still continues as to best of the approaches.

**CONCLUSIONS:**

There was no significant difference between open and laparoscopic appendectomies in terms of surgical site infection. On stratification of SSI, the two modalities were comparable as regards to incisional and deep SSI, even for complicated appendicitis.

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