

## Laparoscopic appendectomy in acute appendicitis with or without complication

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### **Abstract**

Laparoscopic appendectomy has the advantage of providing better access and good visualization of the peritoneal cavity through small incisions, as compared to open appendectomy. we evaluated the safety, outcome and feasibility of laparoscopic appendectomy in patients presenting with or without complications. we observed Appendicular lump was predominantly seen in male patients presenting after 48 hours of acute onset of abdominal pain with associated history of leukocytosis and fever. Laparoscopic appendectomy may potentially have more prominent clinical advantages over conventional surgery, when compared with the impact of LA on uncomplicated appendicitis.

**Keywords:** Laparoscopic appendectomy; Acute appendicitis; Open appendectomy

### **1. Introduction**

Laparoscopic appendectomy (LA) has the advantage of providing better access and good visualization of the peritoneal cavity through small incisions, as compared to open appendectomy (OA). Logically, LA should be beneficial in the management of complicated appendicitis which has more morbidity than simple appendicitis. Despite numerous clinical trials and meta-analyses of the data, it is still not clear whether open appendectomy (OA) or laparoscopic appendectomy (LA) is the most efficacious and effective surgical approach to acute appendicitis presenting after 48 hours with or without complication.

The purpose of the present clinical study was to evaluate the safety, outcome and feasibility of laparoscopic appendectomy in patients presenting after 48 hours of onset of symptoms of acute appendicitis up to 7 days with or without complication.

### **2. Material and methods**

Between June 2012 and September 2014, 104 patients were treated for acute appendicitis out of

which 41 (39.42%) had appendicular lump. All patients with intraoperative diagnosis of acute appendicitis, perforated appendix, appendicular lump/phlegmon, stump appendicitis, gangrenous appendix were included for analysis. Patients with diagnosis other than appendicitis on laparoscopy were excluded. Laparoscopic appendectomy was performed using three-trocar technique. All appendix specimens were sent for histopathological examinations. Antibiotics were continued or stopped according to the clinical findings. Postoperative complications were recorded both during hospitalization and at follow up. The follow up in the outpatient's clinic was at one week, 15 days and at one month intervals for six months. Patients' follow up record was maintained and updated in computer data. Patients were instructed to report back immediately for any complication related to the surgery irrespective of the duration of follow up. Complications recorded were wound infections, fever, intra-abdominal abscess, bowel obstruction, ileus, chest infections, etc. Intraabdominal abscess was defined as symptomatic postoperative collection in the peritoneal cavity, wound infection defined as

purulent discharge from wound, fever defined as temperature more than 100°F and prolonged ileus defined as absence of evidence of peristaltic activity beyond 48 hours of surgery.

To describe the demographic, clinical presentation, operative findings and complication of laparoscopic surgery in appendicitis presenting after 48 hours up to 7 days of acute onset. Means, standard deviation, range, tables were used.

The Fischer's exact test was used for categorical data. P value of <0.05 was considered statistically significant.

### 3. Results

104 patients presenting after 48 hours with diagnosis of acute appendicitis underwent laparoscopic appendectomy (LA) during the study period. There was only one conversion from laparoscopic appendectomy to open due to extreme adhesions of appendix with cecum.

In total 104 patients, mean age was 32.43 with standard deviation of 13.32 in range between 13 to 70. (Cases below the age of 12 years were not included in present study.)

**Table 1: Gender distribution**

Gender	Number of patients	%
Male	51	49.04
Female	53	50.96
Total	104	100

It is evident from above table that number of female patients were more than male. However there was no significant difference between male and female patients. Maximum number of patients (44) presented on 3<sup>rd</sup> day after the onset of right iliac fossa pain. Patients presented earlier were not included. Pain and tenderness was present in all the patients of acute appendicitis with symptoms of anorexia in 71 patients, followed by nausea/vomiting in 43 and fever in 22 patients. Rebound tenderness was seen in 54 and palpable lump was present in 22 patients. Leucocytosis was present in 41 patients. Modified Alvarado score was calculated in all patients. Alvarado score of 7-9 was seen in 57 (54.80%), 10 patients had equivocal score and 37 patients had score of 3-4. Out of 113 cases initially included, 9 cases were excluded as there was evidence of ovarian pathology with no features suggestive of acute appendicitis on laparoscopy. Out of 104 patients included in this study, on laparoscopy 59 patients had inflamed appendix, 41 patients had appendicular lump, one with gangrenous appendix, 2 with perforated appendix and one with stump appendicitis.

Maximum number of patients with appendicular lump (15 patients) belonged to age group 21-30 followed by 8 patients in age group 31-40 years. Out of 41 patients with appendicular lump the mean age of patients was 33.07 with standard deviation of 15.70 in range between 13-70 years of age. Appendicular lump was predominantly seen in male patients (26) as compared to female (15) with significant p-value of 0.018. Sonography was suggestive of normal appendix in 44 cases, appendicitis in 44 cases and appendicular lump in 19 cases and appendicular perforation in 9 cases. However laparoscopy detected 9 patients having normal appendix, 60 patients having inflamed appendix, 41 patients having appendicular lump and 3 patients having appendicular perforation. Laparoscopy can detect the appendicular lumps which may not be palpable on clinical examination or may not be detected on Ultrasonography. Out of 41 patients having appendicular lump on laparoscopy only 22 patients had palpable lump and USG could detect the lump in only 19 patients. This indicates that appendicular lumps which can be detected on laparoscopy may be missed on clinical examination and USG is not very reliable for the diagnosis of appendicular lump.

**Table 2: Laparoscopic findings in 113 Patients suspected acute appendicitis**

	Sonography findings	Laparoscopic findings	P-value
No evidence of appendicitis	44	9	<0.001, HS
Appendicitis	44	60	0.033, S
Appendicular lump	19	41	0.001, HS
Appendicular perforation	6	3	0.307, NS

Appendicular lump formation was predominantly seen on 4<sup>th</sup> day (17 patients) followed by 5<sup>th</sup> day (12 patients) of duration of abdominal pain with diagnosis of acute appendicitis presenting after 48 hours. Out of 41 patients with appendicular lump 29 patients had leucocytes count >10,000 which is highly significant with p-value of 0.001. Fever was seen in 24 patients having appendicular lump with highly significant p-value of 0.001. Out of 103 patients who were successfully operated laparoscopically, 21 patients developed minor complications like fever in 11 (10.67%) patients, 5 (4.85%) patients had postoperative ileus that delayed their start of oral intake and 5 (4.85%) patients had port site infection. There were no cases of postoperative bowel obstruction and no mortality. There were no long term complications in any patient on follow up.

#### 4. Discussion

Laparoscopic appendectomy has now gained a favourable reputation uniformly. Several Meta analyses and comparative studies 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, quicker return to work, and improved cosmesis.[1]

Few clinical studies on laparoscopic appendectomy for complicated appendicitis have actually raised some serious questions.[2] Early reports have shown an increase in postoperative intra-abdominal abscess for burst or perforated appendicitis using the laparoscopic technique. Surgical learning curve issues and increased manipulation of the appendix have also been implicated.[3]-[7]

An appendicular mass is a common surgical clinical entity, encountered in 2-6% of patients presenting with acute appendicitis.[8]-[10] The treatment of appendicular mass is taking a turn from the traditional approach of initial conservative treatment followed by interval appendectomy to immediate appendectomy.[11][12] However this change is not widely accepted and a large number of surgeons still continue to adopt the same traditional conservative approach.[13]

The non-operative management of patients presenting with appendicular mass is not always successful. Authors estimates that approximately 10-20% of such patients fail to respond and require a delayed and potentially more difficult appendectomy with a possible laparotomy and bowel resection. Moreover, approximately 50% of patients may suffer a recurrence of their appendicitis/appendicular mass following discharge from hospital.<sup>11</sup> A large numbers of patients refuse readmission for operation once their acute problem is solved and this is a major disadvantage of the initial conservative approach.

Another disadvantage of the conservative management is the chance of misdiagnosis (15%) as conditions such as intussusception and carcinoma of the caecum may be treated conservatively by mistake adding considerable morbidity.[14] Also in about 50% of patients managed conservatively, the appendix is totally destroyed or atrophied (fibrosis) with obliterated lumen of the appendix so no risk of recurrent acute attack and nothing else needed to have been done in those patients. Many studies suggested that Laparoscopic appendectomy

decreases the rate of superficial surgical site infection and length of stay and provides earlier enteral feeding, with better cosmetic results both in non complicated appendicitis, and complicated appendicitis.[15]-[17]

Out of 376 patients of acute appendicitis which were hospitalised in two years in our institution, 30% of cases presented late (3 days to 7 days). Appendicular lump was detected in 41 patients out of 104 patients (39%) presenting late in comparison to patients presenting early where the lump formation was seen in only 6% of cases.[19] In present study maximum number of patients belonged to age group 21-30, followed by second highest in 31-40 with mean age of 32.43. Similar age distribution has been reported by Cash and Frazee (2012) [12] and Kefagias *et al* (2008)[13].

Although number of female patients was more in present study with 50.96% there is no significant difference in gender distributions. Maximum number of patients presenting late with acute appendicitis were observed on 3<sup>rd</sup> day (patients presenting early were not included in this study) followed by fourth day and similar duration of presentation is reported by Pandey *et al*[20].

Though there are lots of advances in the diagnostic field with the invention of sophisticated investigations; diagnosis of acute appendicitis remains an enigma for the surgeon. Laparoscopy is highly significant in diagnosis of appendicitis[21] and also plays definitive role in diagnosis of other conditions which mimic appendicitis especially in females and old age group.<sup>22</sup> Laparoscopy has reduced the rate of histologically normal appendectomies due to intra-operative visualization of the appendix from 22.8% to 10.2%<sup>23</sup> A macroscopically normal-looking appendix can be left in place. [24]

Corsale *et al* reported that laparoscopy revealed various diseases without appendicitis in 11 (17.7%) patients[25]. Similar results are obtained in present study with 9(8.65%) patients suggestive of acute appendicitis but appendix was normal on laparoscopy and there was ovarian pathology. USG is not a reliable investigation for the diagnosis of acute appendicitis[26]. Kumar *et al*[27] suggested that laparoscopy is highly reliable in diagnosis of other pathological conditions of Right Iliac Fossa pain and similar findings observed in present study.

**Appendicular lump** were predominantly seen in male gender having statistical significant p-value of 0.018 in present study. Similar gender wise distribution noticed in following series:

**Table 3: Comparison of gender distribution of appendicular lump in different series**

Gender	Number of patients			
	Pandey <i>et al</i> 2013[17]	Vishvanathan <i>et al</i> (2011)[25]	Kumar <i>et al</i> (2013)[29]	Present study
Male	40	13	38	26
Female	22	6	12	15
Total	62	19	50	41

Appendicular lump was detected on laparoscopy in highest number of patients presenting on 4<sup>th</sup> day of acute episode of abdominal pain followed by 5<sup>th</sup> day in present study. Similar distribution was also proven by literature and comparable with the study reported by Pandey *et al*[20] they also observed 60% of patients were febrile at the time of presentation having lump. Similar findings were observed in 58.53% of patients having appendicular lump in present study with highly significant p value of 0.001.

There was no mortality in present study and only one patient required conversion to open surgery due to difficult adhesions with caecum. Similar results obtained in various studies mentioned in table below:

**Table 4: Comparison of laparoscopic conversion rate**

Study name	No. of patients required conversion	Total No. of patients
Vishvanathan <i>et al</i> [25]	1	19
Garg <i>et al</i> [13]	2	49
Bicakci <i>et al</i> [32]	3	72
Kumar <i>et al</i> [33]	1	50
Bhuiyan <i>et al</i> [34]	2	60
Kehagiyas <i>et al</i> [35]	2	128
<b>Present study</b>	<b>1</b>	<b>104</b>

Duration of operation depends upon the condition of phlegmon. If adhesion between right iliac fossa structures is firm slow dissection is required to avoid inadvertent caecal injury. In early lump, dissection is easier because there are fibrinous adhesions which can be separated by blunt dissection. The incidence of intra abdominal abscess after laparoscopic appendectomy is 14% [36], wound infection 8.8% [37], and mean hospital stay 2.6 days [39] to 4.22 days<sup>40</sup> for appendicular lump in different series. In present study only 9.61% patients had post operative fever, 4.80% port site infection and 4.80% post operative ileus after 24 hours.

Present study demonstrates results consistent with Vishvanathan *et al*[30] where no septic complication (intra-abdominal abscess) was observed. Early appendectomy clearly avoids these

difficulties and enables a one-admission treatment. Also early surgical intervention is known to be an effective alternative to conservative therapy as it considerably reduces the total hospital stay and obviates the need for a second admission. This substantially reduces the total expenses.[39][40] Hospital stay was not calculated in present study because most of the patients belong to rural population and they want to be discharge after complete stitch removal with histopathological report.

These findings imply 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 every intraperitoneal space contributes to the superiority of the minimally invasive approach over open surgery.[40]

Our experience with laparoscopic appendectomy in appendicular lump is very limited, but as the results are suggestive that laparoscopic appendectomy is safe in management of appendicitis presenting late with or without complication.

## 5. Conclusion

Appendicular lump was predominantly seen in male patients presenting after 48 hours of acute onset of abdominal pain with associated history of leukocytosis and fever.

Our study also demonstrated that laparoscopic appendectomy can be performed safely in acute appendicitis with or without complication with a low incidence of infectious complications and offering patients faster recovery than open appendectomy. Laparoscopic appendectomy may potentially have more prominent clinical advantages over conventional surgery, when compared with the impact of LA on uncomplicated appendicitis.

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