A Prospective Study on Laparoscopic Intervention in Acute Appendicitis in a Teritiary Care Hospital, North Andhra

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ABSTRACT

BACKGROUND

We wanted to determine the various pre-operative and intra-operative factors responsible for conversion to open technique of appendectomy and compare the clinical outcomes of hospital-stay and operating time between open appendectomy and laparoscopic appendectomy.

METHODS

Patients presented to General surgery Department of GITAM Institute of Medical Sciences and Research with features suggestive of acute appendicitis from September 2017 to November 2019 were included in this study. This is a prospective study which included a total of 100 patients. These patients were divided into two groups of 50 each. One group of patients with early presentation with symptoms of less than 3 days of duration, another group with late presentation of 3 or more days of onset of symptoms were included. In this study we wanted to compare the clinical outcomes of hospital stay and operating time between open appendectomy and laparoscopic appendectomy.

RESULTS

In this study, majority of patients belong to age group 20 - 44 years who had delayed presentation to hospital, in contrast to patients who presented early involved the age group of 21 – 30 years. In this study, pain abdomen was the commonest symptom (100 %) with which patient presented. The other symptoms were nausea/vomiting (72 %), fever (63 %). Seven patients presented with diarrhea.

CONCLUSIONS

Our data suggest that laparoscopic appendectomy is associated with improved clinical outcomes even in patients who had late presentation.

KEYWORDS

Appendicitis, Laparoscopic**,** Gangrenous

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BACKGROUND

The appendix was first described in 1521 and inflammation of the appendix has been known to be a clinical problem since 1759.[1,2] Abdominal pain is the prime symptom of the acute appendicitis. Classically pain is initially diffusely cantered in the lower epigastrium or umbilical area, because of inflammation of the organ and increase in the intraluminal pressure, the visceral afferent neurons are stimulated. The term appendicitis, however, was not used until Reginald Fitz described this condition in 1886.[3] Acute appendicitis is one of the commonest surgical emergencies. Simple appendicitis can progress to perforation, which is associated with a much higher morbidity and mortality, and surgeons have therefore been inclined to operate when the diagnosis is probable rather than wait until it is certain.[4] Acute appendicitis is essentially a clinical diagnosis.[5] Around 6 % of the population is expected to have appendicitis in their lifetime. Routine history and physical ration still remain the most practical diagnostic modalities. Absolute diagnosis is only possible at operation and histopathologic examination of the specimen.[6] For this reason, and it is impractical to have a gold standard for definitive pre-operative diagnosis, which leads to an appreciable rate of negative appendicectomy as reported in the world literature varying from 20 - 40 % with its associated morbidity of around 10 %.[6]

Removing normal appendix is an economic burden both on patients and health resources. Misdiagnosis and delay in surgery can lead to complications like mass, perforation and finally peritonitis.[7] Scoring systems are valuable and valid for discriminating between acute appendicitis and non-specific abdominal pain.[8] At present many scoring systems for the diagnosis of acute appendicitis are available. Alvarado scoring system is one of them and is purely based on history, clinical examination and few laboratory tests and is very easy to apply.[9] The negative appendicectomy rate can be reduced to 0 - 5% by the use of the objective scoring system such as the Alvarado system. However, it is not a substitute for clinical judgment. It is an aid in diagnosing acute appendicitis and arriving at a conclusion whether a particular case should be operated or not, thereby reducing the number of negative laparotomies. Some authors consider emergency laparoscopy as a promising tool for the treatment of abdominal emergencies able to decrease costs and invasiveness, maximize outcomes and patients' comfort.[10,11] One of the study[12] has shown that laparoscopic appendectomy is safe and results in a faster return to normal activities, less pain with fewer wound complications. Both procedures are safe and effective for the treatment of acute appendicitis.[13] By using ultrasonography, it has 85% sensitivity and more than 90 % effective for the diagnosis of acute appendicitis. A normal appendix is usually not visualized, or if seen, is compressible. Although most patients with appendicitis will be accurately diagnosed based on the history, physical examination, laboratory studies and, if necessary, imaging studies also. The frequency of obstruction rises with the severity of the inflammatory process. The lumen of the appendix is small in the relation to its length and this configuration may predispose to closed-loop obstruction. The proximal obstruction of the appendiceal lumen produces a closed-loop obstruction, and continuing normal secretion by the appendiceal mucosa rapidly produces distension. Distension increases from continued mucosal secretion and inflammatory exudates from rapid multiplication of the resident bacteria of appendix. Oedema and mucosal ulceration develop with bacterial translocation to the submucosa.

Objectives

1. To determine the various pre-operative and intra operative factors responsible for conversion to open technique.
2. To compare the clinical outcomes of hospital-stay and operating time between open appendectomy and laparoscopic appendectomy.

METHODS

Patients presented to General Surgery Department of GITAM Institute of Medical Sciences and Research with features suggestive of acute appendicitis from September 2017 to November 2019 were included in this study. In the present study, 100 cases of acute appendicitis who attended GITAM Institute of Medical Sciences and Research from November 2017 to November 2019 were included. All cases were subjected to laparoscopic appendicectomy.

Inclusion Criteria

1. All patients with age from 14 – 65 years were included in this study.
2. All patients with clinical diagnosis of appendicitis. This was made on the following criteria.
3. Patients with history of right lower quadrant pain or periumbilical pain migrating to the right lower quadrant with nausea and/or vomiting, fever of more than 38°C and right lower quadrant tenderness on physical examination.

Exclusion Criteria

1. Patients were excluded if the diagnosis is not clinically established.
2. Patients with palpable mass in the right lower quadrant. Ultrasound abdomen suggestive of appendicular abscess or perforation or mass. CT abdomen was not used.
3. Patients who are not fit for general anesthesia (severe cardiac and/or pulmonary disease), inability to give informed consent due to mental disability, and pregnancy.
4. Patients with the history of cirrhosis and coagulation disorders, generalized peritonitis, shock on admission, absolute contraindication to laparoscopic surgery (large ventral hernia, history of laparotomies for small bowel obstruction, ascites with abdominal distension).

Sample Size Calculation

A pilot study was conducted among 20 patients. Pain abdomen was found to be the most common symptom with 94 %. Considering P as 94 %, the sample size was calculated as 87 using the formula. (z = 1.96 for 95 % confidence interval). But we have collected 100 sample size for better results.

$$n \geq \frac{Z_{(1-\propto/2)}{}^{2}}{d^2} \quad P\,(1-P)$$

This is a prospective study which included a total of 100 patients. These patients were divided into two groups of 50 each. One group of patients with early presentation of symptoms of less than 3 days of duration, another group with late presentation of 3 or more days of onset of symptoms were included.

The patients were informed of the risk and benefits of operation and asked to sign a detailed informed consent in their respective native language. Patient's diagnosis was based on history and clinical findings, blood counts and abdominal ultrasonography.

Necessary investigations were performed like ultrasound abdomen, complete blood picture, total counts, chest x-ray, ECG, 2Dechoetc. All cases were subjected to laparoscopic appendicectomy. Pre-operative preparation was done by keeping the patients nil orally, giving adequate parenteral fluids to maintain fluid and electrolyte balance and antibiotics.

Conversion to open appendicectomy was done in few cases. All operated patients had uneventful recovery. Post-operative period was monitored; input and output charts and vital charts were maintained. The variables studied included age and sex distribution, total counts, ultrasound findings, operative difficulties, operative time, operative and post-operative complications, time of resumption of oral intake, total duration of hospital stay and final pathological diagnosis. Patients were discharged as soon as possible.

There was no mortality noted. The patients were followed upto 2 months post operatively. A full record of all the patients was maintained on the proforma designed for this purpose.

Statistical Analysis

Data was entered in MS - Excel and analyzed in SPSS V22. Data were represented with percentages and mean with SD. Fishers exact test & chi-square test was applied to find significance. P < 0.05 was considered as statistically significant.

RESULTS

In this study, 100 cases of acute appendicitis who attended surgical department were selected as per the selection criteria adapted for this study over a period of 2 years from September 2017 to November 2019.

Age	Early Presentation		Late Presentation	
	Count	%	Count	%
< 20	17	34.0	22	44.0
21 - 30	24	48.0	18	36.0
31 - 40	6	12.0	8	16.0
> 40	3	6.0	2	4.0
Total	**50**	**100.0**	**50**	**100.0**

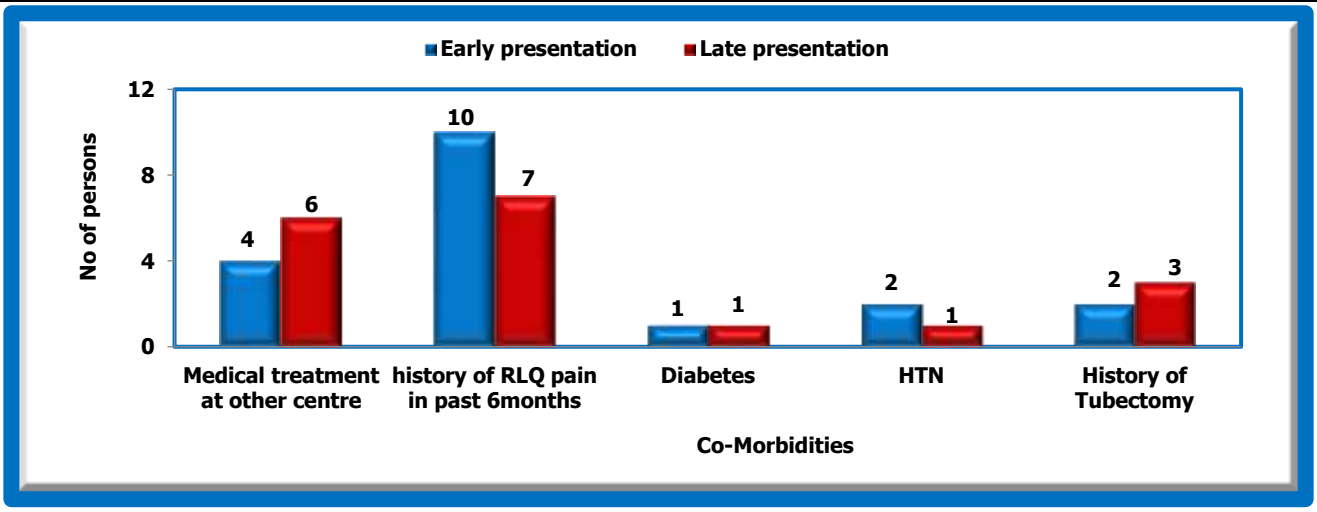
Table 1. Age Distribution

In this study, the mean age of study subjects was 25.92 ± 5.36 years ranging from 14 to 65 years. Majority of patients belonged to age groups 20 - 44 years who had delayed presentation to hospital, in contrast to patients who presented early involved the age group of 21 – 30 years. In this study there was male preponderance of 62 % and female of 38 % with male to female ratio 1.6 : 1. In early presentation, males were 60 %, females 40 % compared to 84 % males and 36 % females in late presentation.

Symptoms	Early Presentation		Late Presentation	
	Count	%	Count	%
Pain abdomen	50	100.0	50	100.0
Nausea / Vomiting	35	70.0	37	74.0
Fever	32	64.0	31	62.0
Diarrhoea	2	4.0	5	10.0

Table 2. Distribution of Symptoms

In this study, all the patients had pain abdomen (100 %) and 72 patients had nausea/vomiting. 63 patients had fever, 7 patients presented with diarrhea. (Table 2)



Graph 1. Distribution of Comorbidities

In this study, 10 patients had taken medical treatment prior to coming to our hospital. Comorbidities like diabetes was present in 2 patients, hypertension in 3 patients, history of tubectomy in 5 female patients. (Graph 1)

(Table 3) total counts were calculated in each patient as a routine investigation. Those more than 10000/cumm were considered as raised and those below it were considered as normal. In this study, 91 % patients had WBC count > 10,000/cumm. 9 % patients had < 10,000/cumm counts.

Total Count	Early Presentation		Late Presentation	
	Count	%	Count	%
< 10000	0	0	9	18
> 10000	50	100	41	82
Total	**50**	**100**	**50**	**100**

Table 3. Distribution of Total Count

In this study most common position of appendix was retrocaecal (79 %), pelvic in 17 % patients. And acute inflamed appendix was found in 89 cases, adhesions in 5 patients. Appendicular mass was present in 6 cases. Acute inflamed appendicitis was more common in patients with early presentation. In this study, most of the factors were surgeon dependent. In this study, the major operative problem was difficulty in localization of appendix in late presentation cases 20 %. Difficulty in adhesiolysis in 4 patients. Conversion to open appendicectomy was done in 5 cases; 2 patients in early presentation and 3 cases in late presentation.

Operative Time	Early Presentation		Late Presentation	
	Count	%	Count	%
30 - 60 min	43	86	38	76
> 60 min	7	14	12	24
Total	**50**	**100**	**50**	**100**

Table 4. Comparison of Operative Time in Early and Late Presentation

Chi-square value = 1.624, Df = 1, P - value = 0.202

The operative time was calculated from the time of induction to the time of application of sterile dressing. Operations were done by different surgeons, anesthesia and anesthetics. Most of surgeries (81 %) was done in between 30 – 60 min. and remaining surgeries (19 %) was done in > 60 min. There was no statistically significant difference between the early and late presentation in operative time. (Table 4)

Hospital Stay	Early Presentation		Late Presentation	
	Count	%	Count	%
≤ 5 days	48	96	41	82
6 - 7 days	2	4	8	16
> 7 days	0	0	1	2

Table 5. Comparison of Hospital Stay in Early and Late Presentation

P - value = 0.076

In this study, the majority (89 %) of patients in both groups had total duration of hospital stay ≤ 5 days and duration of stay ranging from 3 - 10 days with mean of 3.62 days and there is no statistically significant difference between early and late presentation in hospital stay (days). (Table 5)

DISCUSSION

Acute appendicitis is the most common intra-abdominal condition requiring emergency surgery.[14] The possibility of appendicitis must be considered in any patient presenting with an acute abdomen, and a certain pre-operative diagnosis is still a challenge.[15,16] Although > 20 years have elapsed since the introduction of laparoscopic appendectomy (performed in 1983 by Semm, a gynaecologist), open appendectomy is still the conventional technique. Some authors consider emergency laparoscopy as a promising tool for the treatment of abdominal emergencies which is able to decrease costs and invasiveness, maximize outcomes and patients' comfort.[10,11] One study[12] has shown that laparoscopic appendectomy is safe and results in a faster return to normal activities with fewer wound complications.

These findings have been challenged by other authors who observed no significant difference in the outcome between the two procedures, and more over noted higher costs with laparoscopic appendectomy.[17,18] Anyway the recent systematic review of meta-analysis of randomized controlled trails comparing laparoscopic versus open appendectomy concluded that both procedures are safe and effective for the treatment of acute appendicitis.[13] Laparoscopic appendicectomy confers advantages in terms of fewer wound infections, less pain, faster recovery and earlier return to work. In accordance with other studies there were significantly fewer wound infections in the laparoscopy group. A reduction in wound infection can be achieved by extraction of the specimen through a port or with the use of an endobag, or leaving a non-inflamed appendix in place. The main advantage of laparoscopic appendicectomy (LA) is in terms of length of stay and complications. For this reason, Tiwari[19] published a retrospective analysis of 208,314 patients undergoing several laparoscopic procedures (including emergency LA) stratified in different groups and found a reduction in mortality rates, morbidity rates, ICU admissions, hospital admissions in the following 30 post-operative days, lower length of stay and significantly lower costs for all the laparoscopic procedures.

In the present study, 100 cases of acute appendicitis who attended GITAM Institute of Medical Sciences and Research from September 2017 to November 2019 were included. All cases were subjected to laparoscopic appendicectomy. In this study, average age of patients who underwent surgery was 25.92 years and male to female distribution was 62 % and 38 % respectively, ratio 1.6 : 1.This is comparable to the findings of Dr.Arshad et al.[20] who had mean age of 26 years and sex distribution of 65 % males to 35 % females and Okafor et al.[21] with mean age of 27 years and male to female ratio of 2 : 1.

In this study, most common symptom was pain abdomen which was present in all cases, vomiting in 72 % and fever in 63 %. This was comparable with Bulent Kaya et al.[22] who found pain in 100 % and nausea in 63 % and Ali Rafiq et al.[23] who found pain abdomen in 100 %, fever in 60 % and nausea in 80 %. In this study, leucocyte count > 10,000/cumm was seen in 91 % cases, which was comparable to finding of Viswanath et al.[24] with 66 % and

Bulent Kaya et al.[22] with 74.4 % increase in WBC count. A completely normal leukocyte count and differentials is found in approximately 10 % of patients with acute appendicitis.[25] In this study, appendicular mass was found intra operatively in 6 cases in late presentation group. 4 cases were treated with adhesiolysis and laparoscopic appendicectomy; remaining 2 cases were converted to open procedure due to dense local adhesions and gangrenous patchy areas over appendix.

Summary

1. Acute appendicitis is common in males.
2. Clinical examination and ultrasound abdomen are necessary for the diagnosis of acute appendicitis.
3. Mean age of presentation is 25.92 years, ranging from 14 to 62 years.
4. Pain abdomen was the commonest symptom (100 %) with which patient presented. The other symptoms were nausea/vomiting (72 %), fever (63 %). Seven patients presented with diarrhea.
5. Laparoscopic appendicectomy was done in all cases. Acute inflamed appendicitis (48 cases) was more common in patients with early presentation. Late presentation leads to mass formation in 12 % of cases.
6. The major operative problem was difficulty in localization of appendix in late presentation cases (20 %), difficulty in adhesiolysis in 4 patients. Conversion to open appendicectomy was done in 5 cases; 2 patients in early presentation, 3 cases in late presentation group.
7. Factors responsible for conversion to open procedure in this study were dense local adhesions, previous tubectomy with adhesions, appendicular mass and faecolith at the base of appendix.
8. Most of surgeries (81 %) were done in between 30 - 60 minutes. Time ranged from 30 min to 100 min. depending on the infection
9. The major complications were post-operative ileus in 4 patients, wound infection in one patient.
10. No patient developed faecal fistula. No mortality noted.

In this study, the majority (89 %) of patients in both groups had total duration of hospital stay ≤ 5 days with a mean of 3.62 days. Post-operative analgesia requirement, operative time and time to resumption of oral feeds are less in laparoscopic group which is statistically significant ($P < 0.001$).

CONCLUSIONS

A prospective study of laparoscopic intervention in acute appendicitis was done in 100 cases who attended GITAM Institute of Medical Sciences and Research, Visakhapatnam from September 2017 to November 2019. The study was compared with available literature and other studies. Laparoscopy, as a minimally invasive technique, has unique advantages in several areas. However, conventional appendicectomy should not be considered to be wrong, because the difference between the two techniques is rather small and strongly depends on patient characteristics and the treating surgeon's experience.

Conversion to open appendicectomy should be done according to surgeon judgment, experience, and ability to treat the operative findings safely. The main advantages of laparoscopic over conventional appendicectomy were reduced risk of wound infection, reduced post-operative pain, short hospital stay, and faster return to normal activities. Our data suggests that laparoscopic appendectomy is associated with improved clinical outcomes even in patients who had late presentation.

In our hands, laparoscopic appendicectomy has proven to be safe and effective. Laparoscopic surgery has significant advantages in terms of lower invasiveness and better diagnostic capability.

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