

Original Research Article

Evaluation of conservative management in uncomplicated acute appendicitis

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ABSTRACT

Background: Appendectomy has been the treatment for acute appendicitis for years based on the understanding that acute appendicitis always leads to perforation and peritonitis. However, there is growing evidence that a significant proportion of patients can be successfully managed with conservative treatment without developing gangrene or perforation. Conservative treatment avoids discomfort, surgery-related morbidities and minimizes treatment cost.

Methods: 60 patients taken up for conservative management were evaluated and followed up for 6 months. Study patients received intravenous antibiotics for 2 days. Repeated clinical and TLC monitoring were done. In patients whose clinical condition did not improve, appendectomy was performed. Follow-up at 10 days, 30 days, 3 months and 6 months were carried out to assess recurrence in conservatively managed patients.

Results: In this study, the mean age was 25.65 years with a standard deviation of ± 8.96 years. The incidence of uncomplicated appendicitis was 63.3% in males and 36.7% in females. Mean Alvarado score was 7.75 with a standard deviation of ± 1.20 . Failure of conservative management (conversion to appendectomy) was observed in 11.7% of patients and 4 patients (6.6%) had recurrence within 6 months. The overall treatment efficacy was 81.7%.

Conclusions: In many cases, first attack of uncomplicated acute appendicitis can be treated successfully by conservative management. Treatment failure on primary admission as well as short-term recurrence up to six months after conservative treatment is low and acceptable. Incidence of complications like perforation and abscess formation are also statistically low.

Keywords: Appendicitis, Treatment failure, Recurrence, Appendectomy, Alvarado score

INTRODUCTION

Acute appendicitis is one of the most common problems encountered by a general surgeon, accounting for approximately 1% of all surgical operations.¹ It is estimated that as much as 6 to 7% of general population will develop appendicitis during their lifetime, with the incidence peaking in the second decade of life (between 10 and 19 years of age).² More than 50% cases occur before 30 years of age. Among teenagers and young adults, the male to female ratio is about 3:2. After age 25 years, the ratio gradually declines until the sex ratio is equal by the mid-30's.³ The classical understanding is that luminal obstruction, secondary to faecolith, lymphoid hyperplasia,

or malignancy is the main initiator of the process of inflammation. The lack of luminal drainage leads to bacterial overgrowth while increased pressure leads to mucosal ischemia with impaired venous and lymphatic drainage. This combination leads to development of acute appendicitis, which, left unchecked can lead to gangrenous and perforated appendicitis.^{4,5}

However, this teaching has been challenged by a number of studies, demonstrating low frequency of obstructing lesions in addition to normal intraluminal pressures found *in vivo* on patients undergoing appendectomy.⁶ This different understanding of the progression of appendicitis which includes dietary, environmental and genetic factors

has made itself relevant through new methods of treating appendicitis, namely non-operative management.^{7,8} Appendectomy has been the treatment of choice for appendicitis for many years based on the understanding that if not treated, acute appendicitis would always lead to perforation and peritonitis. This assumption has been doubted and today, there is a significant evidence for spontaneous resolution of acute appendicitis.⁹ Non-operative management of inflammatory pathologies in the abdomen has been favoured for other conditions like diverticulitis and successfully been carried out for many years now.¹⁰ Non-operative management of acute uncomplicated appendicitis has been proven to be effective in the past for a short term.¹¹

Recent evidence indicates that patients with acute uncomplicated appendicitis can be managed safely and effectively with an antibiotics-first approach.¹²⁻¹⁴ One Cochrane analysis, five meta-analysis and some reviews of conservative management of acute appendicitis concluding that majority of patients with acute, uncomplicated appendicitis can be treated safely with an antibiotics-first strategy. Antibiotics that are more effective have become available for the treatment of intra-abdominal infection.

Successful conservative treatment avoids discomfort, minimizes the treatment cost and many possible surgery-related morbidities. It cannot be considered a genuine alternative to appendectomy unless it is equally effective at curing acute appendicitis.¹⁴ The aim of the study was to determine the effectiveness of conservative management in uncomplicated acute appendicitis using antibiotic only approach and to study the treatment failure as well as short-term recurrence of conservative treatment.

METHODS

The study was conducted in the department of surgery, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi for a period of 18 months from 2018-2020. Sixty patients were included in the study for conservative management and each patient was evaluated further for a follow up period of 6 months for any recurrence. Previously researchers have performed studies on efficacy (successful with no treatment failure or complications) of conservative management of uncomplicated acute appendicitis.⁸⁻¹⁰ The efficacy found in these articles ranges from 70% to 95%. Therefore, assuming $p=80\%$ as the efficacy with 10% margin of error, the minimum required sample size at 5% level of significance is 62 patients.

So, we selected 60 patients for this study. Patients aged above 12 years and clinically diagnosed case of acute appendicitis presenting within 48 hours of initiation of abdominal pain with modified Alvarado score more than or equal to 5 and confirmed by ultrasound abdomen and pelvis were included in the study. Recurrent appendicitis, cases presenting with complications of acute appendicitis

like abscess, phlegmon, perforation or peritonitis, patients with immunodeficiency status or on immunosuppressive therapy, non-operative management initiated at an outside institution, pregnancy and allergy to antibiotics established in the study protocol were excluded from the study. Treatment failure was defined as lack of improvement or clinical progression indicated by increasing total leukocyte counts, pulse rate, fever and worsening abdominal signs necessitating appendectomy while attempting conservative treatment in the admitted patient. Successful conservative management was defined when the patient had improvement in the symptoms after antibiotic treatment and did not have recurrence during the 6 months follow up period.

Study procedure

Patients satisfying the above inclusion criteria were enrolled. Study patients received intravenous antibiotics-ceftriaxone 1 g 12 hourly and metronidazole 500 mg 8 hourly for 2 days.

During this time patients received intravenous fluids and were nil by mouth for minimum of 24 hrs. Repeated (4 hourly) clinical evaluations which included monitoring of pulse rate, fever, abdominal signs were done along with 24 hourly TLC counts. Patients whose clinical status improved were continued with oral antibiotics ciprofloxacin 500 mg twice a day with tinidazole 600 mg two times a day for a total of 7 days.

In patients whose clinical condition did not improve, appendectomy was performed according to the usual practice. The appendix was sent for histopathological examination. Follow-up at 10 days, 30 days, 3 months and 6 months were carried out to assess recurrence with ultrasound abdomen done during each follow up visit. Recurrence of appendicitis was managed either surgically or conservatively depending upon the treating surgeon and patient preference.

RESULTS

Age and sex distribution of patients

In this study, the mean age was 25.65 years with a standard deviation of ± 8.96 years. The age range was between 12 and 55 years. In the total of 60 cases, maximum cases- 26 (43.3%) belonged to age group 21-30 years, followed by 20 cases (33.3%) in the age group 11-20 years. The incidence of uncomplicated appendicitis in males was 63.3% and in females was 36.7% (Table 1).

Distribution according to Alvarado score (at presentation)

The study showed a mean Alvarado score of 7.75 with a standard deviation of ± 1.20 . Maximum number of cases- 19 (31.7%) presented with an Alvarado score of 8 followed by 13 cases (21.7%) with a score of 9 (Table 2).

Outcomes of conservative management

The study showed that 7 patients (11.7%) had failure of conservative management (conversion to appendectomy) and 4 patients (6.6%) had recurrence within the study period. The conservative management was successful in 49 patients (81.7%) (Table 3).

Incidence of complications (overall)

The study showed that 14.3% of patients who had failure of conservative management (conversion to appendectomy) had appendicular perforation and the rest 85.7% of patients who had failure of conservative management (conversion to appendectomy) did not have appendicular perforation with a p value of 0.117 which is statistically insignificant (Table 4).

Incidence of adhesions (intra-operatively)

The study showed that 28.6% of patients who had failure of conservative management (conversion to

appendectomy) had adhesions and 71.4% of patients who had failure of conservative management (conversion to appendectomy) did not have adhesions with a p value of 0.012 which is statistically significant (Table 5).

Length of hospital stay

In our study, the mean length of hospital stay was 3.17 with a standard deviation of ± 0.42 (Table 6).

Rate of recurrence of acute appendicitis

The study showed that out of the 53 patients successfully managed conservatively, 4 patients (7.5%) had recurrence within the study period.

The overall recurrence rate among 60 patients was 6.6%.

The recurrence rate at 1st month was 1.9%, recurrence rate at 3rd month was 1.9% and at 6th month was 3.9% with a p value of 1, which is statistically insignificant (Table 7).

Table 1: Age and sex distribution of patients.

Age groups (years)	Frequency	Percentage (%)	Sex	Frequency	Percentage (%)
11-20	20	33.3	F	22	36.7
21-30	26	43.3	M	38	63.3
31-40	8	13.3	Total	60	100
>40	6	10.0			
Total	60	100			
Mean±standard deviation	25.65±8.96				

Table 2: Distribution according to Alvarado score (at presentation).

Alvarado score	Frequency	Percentage (%)
6	12	20.0
7	12	20.0
8	19	31.7
9	13	21.7
10	4	6.7
Mean±standard deviation	7.75±1.20	

Table 3: Outcomes of conservative management.

Outcomes	Frequency	Percentage (%)	Mean age (years)	Male	Female
Successful (treatment efficacy)	49	81.70	25.1	33	16
Treatment failure	7	11.70	28.4	4	3
Recurrence	4	6.60	18.25	1	3

Table 4: Incidence of complications (overall).

Complications	Frequency	Percentage (%)
Failure of conservative treatment	7	11.70
Appendicular perforation	1	1.70
Abscess formation	0	0
Peri-appendiceal adhesions	2	3.30

Table 5: Incidence of adhesions (intra-operatively).

Adhesions	Frequency	Percentage (%)
No	2	28.6
Yes	5	78.4
Total	7	100

Table 6: Length of hospital stay.

Length of hospital stay	Frequency	Percentage (%)
3	51	85.0
4	8	13.3
5	1	1.7
Total	60	100
Mean±SD	3.17±0.42	85.0

Table 7: Rate of recurrence of acute appendicitis.

Rate	Frequency	Percentage (%)
Recurrence (10th day)	0/53	0.0
Recurrence (30th day)	1/53	1.9
Recurrence (3rd month)	1/52	1.9
Recurrence (6th month)	2/51	3.9
Recurrence (10th day)	0/53	0.0

DISCUSSION

In our study, we evaluated the effectiveness of conservative treatment in uncomplicated acute appendicitis, treatment failure and short-term recurrence up to 6 months with special reference to incidence of appendicular perforation, adhesions, and abscess formation. Each variable was assessed according to age, sex and Alvarado score. In this study, the mean age was 25.65 years with a standard deviation of ± 8.96 years. The age range was between 12 and 55 years. In the total of 60 cases, maximum cases- 26 (43.3%) belonged to age group 21-30 years, followed by 20 cases (33.3%) in the age group 11-20 years. The age incidence is comparable with the study of Gedam et al, 2017 in which the mean age was 30.45 years with standard deviation of 9.71 and range between 18-61 years.¹⁵ In his study of total 71 cases of uncomplicated acute appendicitis, maximum number of cases- 32 (45.07%) belonged to age group >20-30 years, followed by 22 cases (30.98%) in the >30-40 years age group.

The sex distribution in the study showed male preponderance with a male to female ratio of 1.72:1, male patients constituted 63.3% whereas females accounted for 36.7% of total patients. This finding is comparable to the study by Hof et al, 2005 in which sixty-four men and 39 women, ranging in age from 16 to 82 years were enrolled with a male to female ratio of 1.64:1.¹⁶

The study showed a mean Alvarado score of 7.75 with a standard deviation of ± 1.20 . Out of the 60 cases, maximum number of cases- 19 (31.7%) presented with an Alvarado score of 8 followed by 13 cases (21.7%) with a score of 9.

Majority of patients (80%) had an Alvarado score of 7 or more which is similar to the value observed in the study by Kalan et al who put forth the Alvarado score in 1994.¹⁷

This study showed that 11.7% of patients had failure of conservative management (conversion to appendectomy). The failure rate matches with the study by Styruud et al, 2006 who conducted a randomized trial in which, antibiotic treatment of acute appendicitis was compared with appendectomy in men (aged 18-50 years).¹⁸ The results of his study showed that 88% recovered without surgery. As many as 18 patients (12%) had failure and underwent surgery within 24 hours. Of these, 17 had an acute appendicitis, with 7 having a perforated appendicitis and 1 patient with terminal ileitis. In the meta-analysis by Varadhan et al in 2010 comprising a total of 159 patients with a mean AIR (Appendicitis inflammatory response) score of 4.9 and a mean Alvarado score of 5.2, it was observed that the short-term (7 days) non-operative management failure rate was 11.9%.¹⁹

No statistically significant correlation could be observed between failure of conservative management and the age and gender of the patient.

The study showed that 71.4% of patients with Alvarado score of 9 had failure of conservative management and 28.6% of patients with Alvarado score of 10 had failure of conservative management which has a p value of <0.001 which is statistically significant. Hence, it is inferred that there is a significant correlation between Alvarado score and failure of conservative management. Higher Alvarado score at presentation increases the chances for failure of conservative management. It is comparable with the study

by Winn et al, 2004 in which he divided their study population into three groups based on the Alvarado score: group 1- Alvarado score 4 or less, group 2- Alvarado score 5 to 7 and group 3- Alvarado score 8 to 10. It was observed that majority of patients (77.4%) in group 3 had failure of conservative management and ended up needing appendectomy whereas only 6.7% of patients in group 2 had failure of conservative management indicating that Alvarado score can help predicting the outcome of conservative management.²⁰

This study showed that only 14.3% of patients who had failure of conservative management (conversion to appendectomy) had appendicular perforation. No statistically significant correlation could be found between incidence of appendicular perforation and failure of conservative management. Appendicular perforation rate ranging from 15-25% has been observed in various studies.^{18,21} We observed that 28.6% of patients who had failure of conservative management (conversion to appendectomy) had peri-appendiceal adhesions intra-operatively which was statistically significant with p value of 0.012. Hence it was implied that the time lapsed by conservative management promotes the formation of adhesions which can be significant from an operative point of view.

In our study, the mean length of hospital stay was 3.17 with a standard deviation of ± 0.42 . It is similar to the study by Hansson et al in which the mean length of hospital stay was 2.3 days ± 0.1 .²²

The overall rate of recurrence among 60 patients was 6.6% (4 out of 60 cases). The recurrence rate at 1st month was 1.9%, recurrence rate at 3rd month was 1.9% and at 6th month was 3.9% with a p value of 1, which is statistically insignificant. The recurrence rate is comparable with the study by Turhan et al, 2006 in which 107 patients were conservatively managed with IV: ampicillin 1 g four times daily, gentamycin 160 mg twice daily and metronidazole 500 mg thrice daily for a follow up period of 1 year and had recurrence in 9 patients with a recurrence rate of 9.4%.²³ However, in APPAC trial (2018) on non-operative treatment of appendicitis, 100 of 256 patients in the antibiotic group (39.1%) ultimately underwent appendectomy after 5 years of follow up. Most of these patients (70/100, 70%) had their episode of recurrent appendicitis within 1 year of initial presentation.²⁴ The recent meta-analysis by Harnoss et al (2017) reported a recurrence rate of symptoms within 1 year of 27.4% following antibiotic first treatment.²⁵ The reason for a decreased rate of recurrence in our study (6.6%) can be explained by a shorter period of follow up of 6 months compared to 5 years and 1 year follow up period in the above 2 studies. Efficacy of conservative treatment or overall success rate is a highly controversial issue in various meta-analyses. The overall success rate of conservative management (treatment efficacy) as defined in our study was 81.7% (49 out of 60 cases). A meta-analysis by Podda et al (2019) compared the conservative

management and appendectomy therapy in uncomplicated acute appendicitis.²⁶ They found treatment efficacy rate of 72.6% and 93.1% in two groups respectively. In the meta-analysis by Yang et al (2019), the efficacy of conservative treatment of uncomplicated acute appendicitis was 80.2% which is comparable to our study.²⁷

Limitations

Our Study population was small comprising of 60 patients with a follow up period of 6 months. Most recurrences after conservative management of acute appendicitis occurs up to 1 year after the first attack. Though the study gave us a fair idea about the outcome of conservative management of acute appendicitis but for wider applicability a larger sample size with a longer follow up period is needed.

CONCLUSION

Conservative treatment of uncomplicated acute appendicitis is an effective and safe option in majority of the patients though it carries a small risk of recurrence. It may be recommended as a first line treatment as it does not carry the risk associated with anaesthesia and surgery. In future we need to have studies which evaluate all the factors that adversely affects the success of conservative management and criteria need to be devised which predict successful outcome.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional ethics committee.

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