

Management of Appendicitis Presenting with Abscess or Mass

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Purpose: Management strategy in acute appendicitis patients initially presenting with abscess or mass is surrounded with controversy. This study was performed to identify the outcomes of management for this condition.

Methods: We retrospectively analyzed prospectively registered 76 patients (male:female = 39:37; mean age, 50.8 years) with appendicitis presenting with abscess or mass over a 9-year period at the Seoul National University Hospital. Patients were divided into three groups (emergency operation group, delayed operation group, and follow-up group), and clinical characteristics and outcomes of treatment were investigated.

Results: Twenty-eight patients (36.8%) underwent an emergency operation. Of the remaining 48 patients, 20 (41.7%) were initially treated with conservative management through the use of antibiotics only; the other 28 (58.3%) with and additional ultrasound-guided percutaneous drainage of the abscess. Twenty-six (54.2%) patients underwent planned operations after conservative management, and 22 (45.8%) were followed without surgery (median duration, 37.8 month), of which 3 (13%) underwent an appendectomy due to recurrent appendicitis (mean of 56.7 days after initial attack). There were no statistical differences in types of operation performed (appendectomy or ileocecectomy), postoperative complications, and postoperative hospital stay among the patients who underwent emergency operations, delayed operations and operations for recurrence during follow-up.

Conclusion: Although the recurrence rate was relatively low after conservative management for appendicitis patients presenting with abscess or mass, there was no difference in surgical outcome between the emergent, elective, or recurrent groups. Our results indicate that proper management of appendicitis with abscess or mass can be selected according to surgeon's preference.

Keywords: Appendicitis; Abscess; Mass; Treatment outcome

INTRODUCTION

Appendicitis is the most common cause of pain requiring surgery. Fitz et al. described and diagnosed appendicitis in 1886 for the first time, and McBurney performed an appendectomy in 1894 for the first time. Since then, the appendectomy has

been established as the standard treatment for appendicitis [1]. Nevertheless, 2-7% of appendicitis patients do not have simple appendicitis, but have appendicitis that manifest itself with complex features such as an abscess in the periappendix, right lower quadrant masses due to acute inflammation in connective tissues, etc. [2-4]. When emergency surgery is performed on such cases, due to inflammation in a wide area within the abdominal cavity, adhesion of the intestines, sepsis after surgery, fluid collection within the abdominal cavity, and re-surgery for adhesion of the intestines, healing of surgical wounds has been shown to be delayed substantially [5-7]. Therefore, recently, for patients suspected of having appendicitis associated with an abscess in the periappendix, instead of traditional emergency surgery, the trend has been to perform conservative treatments, for example, ultrasound-guided percutaneous drainage and antibiotic treatments first and subsequently to

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perform an interval appendectomy after a certain time: nonetheless, until now, standard treatment protocols have not been established, so this issue is still controversial [2, 6, 8]. In addition, in regard to the interval appendectomy being always required because of the risk of recurrence of appendicitis after conservative treatments, recently the recurrence rate has been reported not to be high, approximately 7%, in several studies; thus, after successful conservative treatments, an interval appendectomy is not always necessary [9-12].

We conducted this study to evaluate the outcomes by dividing appendicitis patients associated with abscess in the vicinity or a mass in the right lower abdomen into three groups: one that underwent emergency surgery, a second that underwent early conservative treatments followed by elective surgery, and a third that underwent conservative treatments and follow-up observation only.

METHODS

A retrospective study was performed on 76 patients diagnosed as having acute appendicitis by physical examination and abdominal computed tomography (CT) at the Department of Surgery, Seoul National University Hospital, from January 1998 to February 2008. Patients who underwent emergency surgery were defined as the emergency surgery group (Group 1). Patients treated with conservative management through the use of antibiotics with or without ultrasound-guided percutaneous drainage were defined as the conservative treatment group, which was subdivided into the interval surgery group whose patients underwent surgery at a certain time after the initial treatments (Group 2A) and the ambulatory follow-up observation group whose patients underwent ambulatory follow-up observation continuously (Group 2B).

The clinical characteristics of patients, the type of surgery, and the follow-up observation were analyzed based on electronic medical records. The follow-up observation period was from the day of the first visit to the most recent visit to our outpatient clinic. As clinical characteristics, the gender of the patients, age, major symptoms, the duration of pain prior to admission, body temperature at the time of admission, heart beat, the number of leukocytes, the presence or absence of an abscess or masses in the periappendix and size, and associated chronic diseases were assessed. In regard to treatments, whether emergency surgery was performed, whether percutaneous drainage was performed, and whether interval surgery was performed after the initial conservative treatments were assessed. In the ambulatory follow-up observation group, recurrence and surgery during the ambulatory follow-up observation period were assessed. Regarding patients who underwent surgery, the period from the onset of symptoms to the day of operation, surgical methods, operation time, the postsurgical hospitalization period, and postsurgical complications were analyzed.

For statistical analysis, the SPSS ver. 17.0 for Windows (SPSS Inc., Chicago, IL, USA) was used. For statistical validation, the student t-test, Pearson's chi-square test, and Fisher's exact test were performed. $P < 0.05$ was determined to be statistically significant.

RESULTS

The mean age of the patients was 50.8 years, and the ratio of males to females was 39:37. Among them, the emergency surgery group included 28 patients (36.8%) and the conservative treatment group included 48 patients (63.2%) (Fig. 1). During the period, the number of patients who underwent an appendectomy at our hospital was 2,203 patients, and our subjects accounted for approximately 3.4% of all appendicitis patients.

Clinical characteristics of the emergency operation group (Group 1)

The mean age of the emergency operation group ($n = 28$) was 47.6 years, and the ratio of males to females was 18:10. The major symptom was pain (21 patients, 75%), and the interval from the onset of symptoms to hospital visit was an average 6.8 days. In addition, nausea and vomiting were associated with 5 patients (17.8%), fever with 1 patient (3.6%), and a mass in the right lower abdomen with 1 patient (3.6%). On the physical examination performed at the time of admission, the body temperature was an average 37.1°C, and the heart beat was an average 87.5 beats/minute. On the blood test, the number of leukocytes was an average 13,253.8/mm². In CT or ultrasonography, an abscess in the periappendix was noted in 26 patients (93%) and a mass in 2 patients (7%), and the size of abscess was an average 4.9 cm (range, 3.0 to 6.1 cm). Patients with under-

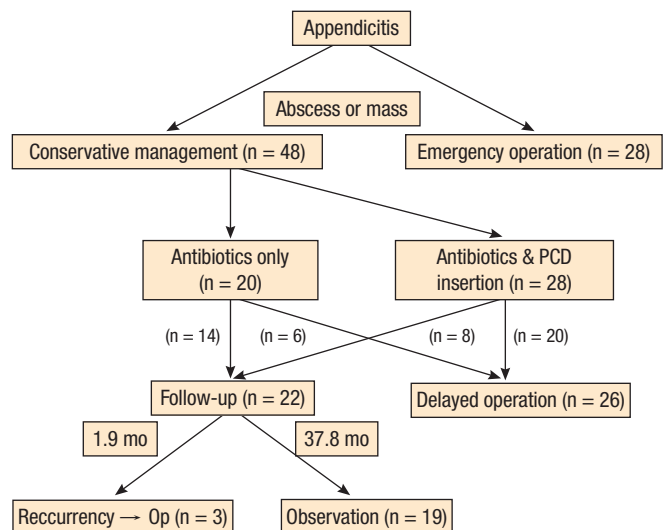


Fig. 1. Management of appendicitis presenting with abscess or mass. PCD, percutaneous drainage.

lying diseases were 7 (25.0%):4 (14.3%) with hypertension, as well as cardiac diseases and 1 (3.6%) each with diabetes, chronic renal failure, and liver cirrhosis.

Clinical characteristics of the conservative management group (Group 2)

The average age of the conservative management group (n = 48) was 52.7 years, and the ratio of males to females was 21:27. As major symptoms, abdominal pain was associated with 43 patients (89.5%), which was most prevalent, and the average period from the onset of symptoms to the hospital visit was 9.7 days. In addition, fever was associated with 3 patients (6.3%), and abdominal distention with 2 patients (4.2%). At the time of admission, on physical examination, the body temperature was an average 36.7°C, and the heart beat was an average 85.7 beats/minute. On the blood test, the number of leucocytes was an average 13,201.3/mm². On CT or ultrasonography, 45 (93.7%) patients were diagnosed as having an abscess in the periappendix, and 3 (6.3%) were diagnosed as having a masses; the abscess size was an average 4.4 cm (range, 2.5 to 7.5 cm). Of the 19 (39.5%) patients with underlying diseases, 7 (14.6%) patients had hypertension and cardiac diseases, 7 (14.6%) patients had diabetes, 4 (8.3%) patients had ongoing tuberculosis and other chronic respiratory diseases, and 1 (2%) patient had liver cirrhosis. The clinical characteristics of the conservative management and the emergency operation groups were not statistically different (Table 1).

Analysis of the patient group requiring surgery after conservative management (Group 2A)

Among patients treated with conservative management in the initial period, 20 patients (41.7%) were treated with only antibiotics, and 28 patients (58.3%) were treated with antibiotics in parallel with ultrasound-guided percutaneous drainage. Interval surgery after conservative management was performed on 26 patients (54.2%, interval surgery group), and 22 patients (45.8%) underwent only follow-up observation with no inten-

tion to undergo interval surgery. The mean age of the interval surgery group (26 pts.) was 49.2 years, and the ratio of males to females was 11:15. The period from the onset of symptoms to hospital visit was an average 9.7 days. At the time of admission, the body temperature was 36.5°C, and the heart beat was an average 84.5 times/minute. On the blood test, the number of leucocytes was an average 13,847.3/mm², the size of the abscess was an average 4.6 cm (range, 3 to 5.5 cm). Six patients (24%) were treated with antibiotics only, and 20 patients (76%) were treated with antibiotics combined with ultrasound-guided percutaneous drainage. Interval surgery was performed after an average of 18 days (range, 5 to 64 days) from the time of initiation of conservative management. Seventeen patients (65.4%) had symptoms that improved and, thus, underwent a planned operation after a certain period (average, 17 days), 4 (15.4%) patients underwent surgery because of the complication of the formation of fistulas after ultrasound-guided percutaneous drainage, 3 patients (11.5%) had diseases that required surgical treatments and underwent surgery for that disease and for appendicitis simultaneously, and 2 patients (7.7%) underwent surgery because appendiceal tumor lesions were suspected (Table 2). In 3 patients with associated diseases requiring surgical treatments, in the case of gastric cancer, a subtotal gastrectomy was performed, in the case of uterine cancer, a hysterectomy was performed, and in the case of diverticulosis of the right colon, a right hemicolectomy was performed.

Table 1. Comparison of clinical characteristics between the emergency operation and the conservative management groups

	Group 1 (n = 28)	Group 2 (n = 48)	P-value
Sex (M:F)	18:10	21:27	0.084
Age (yr)	47.64 ± 15.23	52.71 ± 18.64	0.227
Duration of symptoms (day)	6.79 ± 5.50	9.74 ± 6.90	0.059
Body temperature (°C)	37.13 ± 1.49	36.77 ± 0.71	0.107
Heart rate (pulse/min)	87.52 ± 20.74	85.76 ± 15.37	0.386
WBC count (/mm ³)	13,253.85 ± 4,738.01	13,201.32 ± 4,830.38	0.961
Size of abscess (cm)	4.41 ± 0.93	4.95 ± 1.54	0.058

Group 1, emergency operation group; Group 2, conservative management group.

Table 2. Indications for delayed operation

Delayed operations	No. (%)
Planned interval operations	17 (65.4)
PCD-related complications	4 (15.4)
Other surgical conditions	3 (11.5)
Suspicious of appendiceal tumor	2 (7.7)

PCD, percutaneous drainage.

Table 3. Comparison of surgical outcomes between the emergency operation and the delayed operation groups

	Group 1 (n = 28)	Group 2A (n = 26)	P-value
Operations			
Appendectomy	24 (82.8)	19 (73)	0.637
Ileocectomy	4 (13.8)	6 (23)	
Right hemicolectomy	1 (3.4)	1 (4)	
Operation time (min)	104.82 ± 47.85	88.19 ± 34.85	0.198
Postoperative complications	3 (10.3)	4 (15.3)	0.531
Postoperative hospital stay (day)	9.43 ± 4.73	9.00 ± 8.62	0.809

Values are presented as number (%) or mean ± SD.

Group 1, emergency operation group; Group 2A, delayed operation group.

Table 4. Comparison of clinical characteristics between the delayed operation and the follow-up groups

	Group 2A (n = 26)	Group 2B (n = 22)	P- value
Sex (M:F)	11:15	10:12	0.827
Age (yr)	49.27 ± 18.00	56.77 ± 17.73	0.167
Duration of pain (day)	9.72 ± 6.91	9.76 ± 8.47	0.984
Body temperature (°C)	36.57 ± 0.41	36.58 ± 0.69	0.983
Heart rate (pulse/min)	84.57 ± 14.70	86.95 ± 18.61	0.623
WBC count (/mm ³)	13847.31 ± 4786.90	12438.78 ± 4390.38	0.305
PCD	20 (76%)	8 (36%)	0.005
Size of abscess (cm)	4.65 ± 1.45	5.33 ± 1.56	0.106

Group 2A, delayed operation group; Group 2B, follow-up group.
PCD, percutaneous drainage.

Comparison of the results of surgery in the emergency surgery group (Group 1) with the interval surgery group (Group 2A)

Surgery was determined according to the inflammation level at the time of surgery. In the interval surgery after conservative management group (n = 26), a simple appendectomy was performed on 19 patients (73%), an ileocecectomy was performed on 6 patients (23%), and a right colectomy was performed on 1 patient (4%). The interval from the onset of initial symptoms to the day of surgery was an average 26 days, the operation time was an average 88 minutes, and the postsurgical hospitalization period was an average 9.0 days. Postsurgical complications developed in 4 patients (15.3%): wound infection in 3 cases, and adhesion of intestine in 1 case. In the emergency surgery group, a simple appendectomy was performed on 24 patients (83%), an ileocecectomy was performed on 4 patients (14%), and a right hemicolectomy was performed on 1 patient (3%). The operation time was an average 104.8 minutes, and the postsurgical hospitalization period was an average 9.4 days. Postsurgical complications developed in 3 patients (10%): surgical wound infection in 2 cases and death due to sepsis in 1 case. When the emergency surgery group and the interval surgery group were compared, surgical methods, operation time, postsurgical complications, and the postsurgical hospitalization period were not statistically significantly different (Table 3).

Analysis of the ambulatory follow-up observation group without planned interval surgery after conservative management (Group 2B)

The mean age of the group that only underwent ambulatory follow-up observation without interval surgery after conservative management (n = 22) was 56.7 years, and the ratio of males to females was 10:12. The interval from the onset of symptoms to hospital visit was an average 9.7 days. At the time of admission, the body temperature was an average 36.6°C, and the heart

Table 5. Comparison of surgical outcomes between the delayed operation and the operation-for-recurrence subgroup of the follow-up group

	Group 2A (n = 26)	Group 2C (n = 3)	P- value
Operations			
Appendectomy	19 (73)	3 (100)	0.302
Ileocecectomy	6 (23)	0 (0)	
Right hemicolectomy	1 (4)	0 (0)	
Operation time (min)	88.19 ± 34.85	75.00 ± 24.32	0.616
Postoperative complication	4 (15.3)	1 (33)	0.458
Postoperative hospital stay (day)	9.00 ± 8.62	8.67 ± 1.52	0.948

Values are presented as number (%) or mean ± SD.

Group 2A, delayed operation group; Group 2C, operation-for-recurrence group.

beat was an average 86.9 beats/minute. On the blood test, the number of leucocytes was an average 12,438.7/mm², and the size of the abscess was an average 5.3 cm (range, 2.5 to 7 cm). In 14 patients (64%), only antibiotic treatments were performed, and in the remaining 8 patients (36%), ultrasound-guided percutaneous drainage was additionally performed. When the interval surgery group (Group 2A) and the ambulatory follow-up observation group (Group 2B) were compared, gender, age, the duration of pain prior to admission, body temperature, heart beat, number of leucocytes, and size of the abscess were not statistically significant; nonetheless, in the interval surgery group, the number of patients who underwent ultrasound-guided percutaneous drainage was significantly higher (P = 0.005) (Table 4).

The mean follow-up observation period of the ambulatory follow-up observation group was an average 37.8 months (range, 1 to 82.2 months). Surgery was performed on 3 patients (13.6 %, Group 2C) for recurrent appendicitis. The period after conservative management to the recurrence of symptoms was an average 42.3 days, and the interval from the onset of the initial symptoms to the day of surgery was an average 56.7 days. In all 3 patients, a simple appendectomy was performed, the operation time was an average 75.0 minutes, and the postsurgical hospitalization period was an average 8.6 days. As postsurgical complications, surgical wound infection occurred in 1 patient (33%). When the interval surgery group and the recurrence surgery group were compared, surgical method, operation time, postsurgical complications, and postsurgical hospitalization time were not statistically significant (Table 5).

DISCUSSION

In acute appendicitis patients, the proportion of cases associated with an abscess or a tumor in the periappendix has been reported to be approximately 2% to 7%. When emergency surgery is performed in such patients, the incidence of complications is reported to be up to 26% [12, 13]. If surgery is performed

under the condition that inflammation due to appendicitis has spread to adjacent areas, the inflammation may have spread over a wide area. In addition, because of edema and the vulnerability of the adjacent small intestine and large intestine, secondary fistulas, etc., may have developed. Furthermore, in emergency surgeries, the approach to the appendix is difficult due to inflamed tissues, and surgery may be technically difficult due to deformation of anatomical structures and location. For such cases, instead of completing surgery after a simple appendectomy, cases requiring a simultaneous ileocectomy in areas with inflammation and adhesion or a right colectomy are not rare [6, 8-12]. In addition, in cases with the possibility of tumors, lesions cannot be assessed accurately because of inflammation in the periappendix; thus, an en-bloc resection and extended lymphadenectomy may not be sufficient [14]. Nonetheless, the advantages of performing emergency surgery are that frequent follow-ups and tests are not required in comparison with conservative managements and that re-hospitalization after a certain time for the planned surgery is not required [15, 16].

Nonetheless, in recent numerous studies, in appendicitis associated with abscess and/or mass, after conservative managements, high success rates of 76% to 97% and low incidences of complications have been reported; thus, performing non-surgical treatments, such as antibiotic treatments and ultrasound-guided percutaneous drainage, during the initial period have been proven to be effective and safe [6, 17-20]. Brown et al. [21] conducted studies on the incidence of complications after non-surgical treatments in patients with an abscess in the periappendix, and the results showed that the incidence of complications in patients who underwent conservative managements was 15%, and it was 58% in the group that underwent surgical treatments, which was very high. In our study, among the total 76 patients, conservative managements were performed on 48 patients (63.2%), and in 44 of those patients (91.7%), symptoms could be improved successfully by early conservative management. The remaining four patients (5.3%) required surgery due to the formation of enteric fistulas after ultrasound-guided percutaneous drainage. Similarly, between the group that underwent interval surgery after conservative managements and the group that underwent emergency surgery, treatment outcomes, such as the frequency of an enterectomy, operation time, complications, postsurgical hospitalization period, etc. were not statistically different. Therefore, in our study, similar to the results of other previous studies, early conservative management of appendicitis associated with an abscess or mass was confirmed to be safe. The incidence of postsurgical complications between the two groups was not different. Nonetheless, in the emergency surgery group, one liver cirrhosis patient (child B) with uncontrollable ascites died of hepatic failure associated with sepsis 18 days after surgery, which could be considered as a finding suggesting the possibility of the development serious

complications due to the spread of inflammation during emergency surgery.

The necessity of interval surgery after the improvement of symptoms through initial conservative management for appendicitis associated with an abscess or mass is still controversial. The recurrence rate after non-surgical treatments has been reported to vary from 5% to 37%. In studies showing relatively high recurrence rates, interval surgery to remove the risk of recurrence was suggested [18, 21-23]. However, in a random prospective study conducted by Kumar and Jain [24], the recurrence rate of appendicitis in the group that underwent only observation without surgery after conservative management was 10%, and the total hospitalization period was shortest. In addition, in recent studies, low recurrence rates have been reported, with recurrence being most prevalent within 2 years of the development of initial symptoms, after which recurrence rates decreased [6, 14, 25]. Thus, even for conservative management only, the recurrence rate of appendicitis is not high, and the incidence of complications has been shown to be approximately 12-23% in patients who underwent interval surgery performed after inflamed areas had been reduced; thus, intensive follow-up observation without interval surgery might be useful [6, 26]. In addition, reports indicate that if recurrence of appendicitis is detected early by intensive follow-up observation for a certain time after conservative management and is treated surgically, it can be treated safely [13]. In our study, in 22 patients out of 48 patients (36.8%), only follow-up observation was performed without interval surgery. Appendicitis recurred in 3 of those 22 patients (13.6%), and a simple appendectomy was performed. When the recurrence surgery group and the interval surgery group were compared, surgical method, operation time, complications, and postsurgical hospitalization period were not statistically different. This confirmed that with intensive follow-up observation after conservative management, recurrence of appendicitis could be detected early and surgical treatments could be administered safely. We performed numerous emergency surgeries and interval surgeries after conservative management during the early phase of our study; nonetheless, with the accumulation of clinical experience with low recurrence rates, toward the late phase of the research period, continuous follow-up observation was performed without surgery in many cases. Thus, the frequencies of ultrasound-guided percutaneous drainage for the two groups were significantly different (76% vs. 36%, $P = 0.005$). Particularly, among 3 patients of the ambulatory follow-up observation group who underwent surgery because of recurrence, ultrasound-guided percutaneous drainage was performed in 2 patients.

In patients with an abscess in the periappendix, by the results of pathological tests after surgical treatments, approximately 12% were diagnosed as having different diseases, such as Crohn's disease, tumors, etc.; thus, it has been proposed that interval surgery be required in all patients [6, 8, 14, 17, 27]. Nonethe-

less, it is thought that for patients with a familial cancer history of such diseases and patients in the high-risk group older than 40 years, such disease could be detected immediately after the acute inflammation phase or during the follow-up observation period by regular colonoscopy, barium enema, ultrasonography, or computed tomography, and through this, more appropriate treatment protocols could be established [28, 29]. In our study, during the ambulatory follow-up observation period, a barium enema was performed on 18 patients, and colonoscopy was performed on 3 patients. Among the 18 patients experiencing a barium enema, a tumor lesion in the appendix was suspected in 1 patient and diverticulosis in the right large intestine was suspected in 1 patient. A tumor lesion was suspected by colonoscopic examination in 1 patient; thus, interval surgery was performed. Pathohistological tests on 2 patients who underwent interval surgery for suspicious tumor lesions showed benign mucous cysts.

Our study confirmed that appendicitis associated with an abscess or mass could be treated safely and effectively by initially using conservative managements. In addition, it also confirmed that even in cases involving only ambulatory follow-up observation without interval surgery after conservative managements, the recurrence rate was not high, recurrence of appendicitis was detected early, and surgical treatments could be performed safely. Therefore, as treatment for appendicitis associated with an abscess or mass, the decision whether to perform initial emergency surgery or to perform conservative managements, and if conservative managements are performed, whether to perform interval surgery after a certain period or to perform only the ambulatory follow-up observation depends on the surgeon's overall evaluation of the clinical features of the individuals.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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