

Interval Appendectomy after Conservative Treatment of an Appendiceal Mass

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Abstract

Introduction: The purpose of this study was to clarify the role of interval appendectomy after conservative treatment of an appendiceal mass.

Methods: From January 1998 to December 2003, patients with an appendiceal mass who received conservative treatment at the Taipei Veterans General Hospital were studied retrospectively. Data on demographics, rate of appendicitis recurrence, duration of hospital stay, and complication rate were collected and analyzed.

Results: A total of 165 patients were included (89 males, 76 females). The mean age was 53.6 years (range 7–89 years). The rate of appendicitis recurrence after conservative treatment was 25.5%; most recurred within 6 months after discharge (83.3%). The benefit of preventing recurrence is less than 16% if interval appendectomy is performed 6 weeks after discharge and less than 10% if it is done 12 weeks later. The complication rate of appendectomy performed before or after recurrence was 10% in both groups. The duration of the second hospital stay for patients who underwent interval appendectomy before or after recurrence was 4.43 ± 3.32 vs. 6.75 ± 5.73 days ($P = 0.023$). Of the 165 patients, 17 (10.3%) had their diagnosis changed after survey or surgery, and 5 (3.03%) were found to have colon cancer upon follow-up.

Conclusions: Patients who recovered from conservative treatment of an appendiceal mass should undergo colonoscopy or barium enema to detect any underlying diseases and to rule out coexistent colorectal cancer. Routine interval appendectomy benefits less than 20% of patients.

An appendiceal mass is an inflammatory tumor consisting of an inflamed appendix, its adjacent viscera, and the greater omentum.¹ This mass may or may not contain pus (abscess versus phlegmon). If the amount of pus is large, with a thin walling-off process, it is usually called an appendiceal abscess.² Treatment of an appendiceal mass has been debated for more than 100 years. In 1945, McPherson and Kinmonth presented good results and a low complication rate with nonoperative management.³ Since then, conservative treatment for an appendiceal mass has become the established man-

agement. However, the decision about further interval appendectomy remains controversial. Those who suggest interval appendectomy propose that the recurrence rate of appendicitis remains high in those patients treated conservatively.^{4–6} Appendectomy seems the only way to solve the problem definitively. Furthermore, appendectomy could provide a definitive diagnosis and sometimes reveals an unexpected malignancy. However, another group of surgeons oppose this policy.^{7–9} They point out that the rate of recurrent appendicitis is 6% to 20%,^{7,10,11} and the complication rate of interval appendectomy was not low—about 9% to 19%.^{4,10,12,13} Further appendectomy may incur additional fees that must be paid by

patients and medical organizations. We have tried to answer these questions and to clarify the role of interval appendectomy after conservative treatment of an appendiceal mass.

PATIENTS AND METHODS

Patients

We retrospectively surveyed patients admitted with a diagnosis of appendicitis at the Taipei Veterans General Hospital from January 1998 to December 2003. A total of 1873 patients were diagnosed with acute appendicitis, with 644 patients (34.3%) having a ruptured appendix. Of these 644 patients, 475 underwent immediate appendectomy, and 169 patients received conservative treatment initially. Four patients were excluded owing to a diagnosis other than appendiceal mass (two cecal perforations, one diverticulitis, and one tubal ovarian abscess). Patients who presented with ruptured appendicitis with phlegmon or abscess formation under conservative treatment were included (Fig. 1).

The diagnosis of appendiceal mass was based on clinical findings consisting of right lower abdominal pain for more than 5 days, fever, a right lower abdominal mass (if present), and leukocytosis. Ultrasound (US) or computed tomography (CT) scan was used to confirm the presence of the appendiceal mass. All 165 patients were treated conservatively with intravenous fluid hydration, empiric antibiotics, and nothing per os first. US- or CT-guided drainage was performed if a large amount of pus was present initially or symptoms of fever or abdominal pain failed to diminish after conservative treatment for 3 days with the abscess still present. Medical charts were reviewed, and demographic data were recorded. Each patient's gender, age, duration of symptoms, and body temperature were recorded. The duration of the hospital stay, complications, interval until appendectomy, and methods of operation were also recorded.

Follow-up

After discharge, patients were followed up at the outpatient department. Colonoscopy or barium enema was suggested 5 to 6 weeks after discharge to exclude the possibility of coexistent colorectal cancer or other etiologies, such as cecal diverticulitis. Interval appendectomy was suggested 6 to 12 weeks after discharge. Those who did not undergo an interval appendectomy were followed up at the outpatient department. If signs of recurrent

appendicitis (*e.g.*, right lower quadrant pain, tenderness with or without fever) developed, CT was repeated. Appendectomy was performed if recurrent appendicitis was confirmed. Specimens of the appendiceal surgery were sent for pathologic examination and analyzed.

Statistical Analysis

Data are presented as the mean \pm standard deviation. Descriptive statistics and graphs were employed to characterize the data. Statistical comparisons between groups were made using the independent *t*-test. The chi-squared test was used for categorical data. Probability values of < 0.05 were considered statistically significant. The analysis was carried out using the Statistical Package for the Social Science (SPSS 11.0 version).

RESULTS

Of the 165 patients, there were 89 (54%) males and 76 (46%) females. The mean age was 53.7 years (range 7–89 years). Mean admission body temperature was $37.53^\circ \pm 0.89^\circ\text{C}$, white blood cell count was $13,090 \pm 4480/\text{mm}^3$, and the C-reactive protein level was 12.88 ± 9.19 mg. The mean duration of symptoms before admission was 6.79 ± 6.91 days. One patient expired during hospitalization owing to acute myocardial infarction (mortality rate 0.6%).

Among the 164 patients, 70 underwent an interval appendectomy after discharge before a recurrence of appendicitis. Interval appendectomy was performed a mean of 64 days after discharge (range 28–245 days, SD 64). Altogether, 94 patients did not undergo an interval appendectomy after discharge and had regular follow-up at the outpatient department. Among them, 24 eventually had recurrent appendicitis. Of these 24 patients, 20 underwent appendectomy, and 4 received further conservative treatment. Three of these four patients had further conservative treatment because of old age, poor medical condition, or were at high risk for surgery. The other patient refused operation and insisted on receiving further conservative therapy. One of these four patients suffered a second recurrence and underwent further conservative treatment; the other three patients were recurrence-free and received outpatient follow-up. Follow-up durations for these four patients were 11, 25, 33, and 49 months, respectively (mean 29.5 months). The remaining 70 patients were recurrence-free during outpatient follow-up. Mean patient follow-up for all of the 164

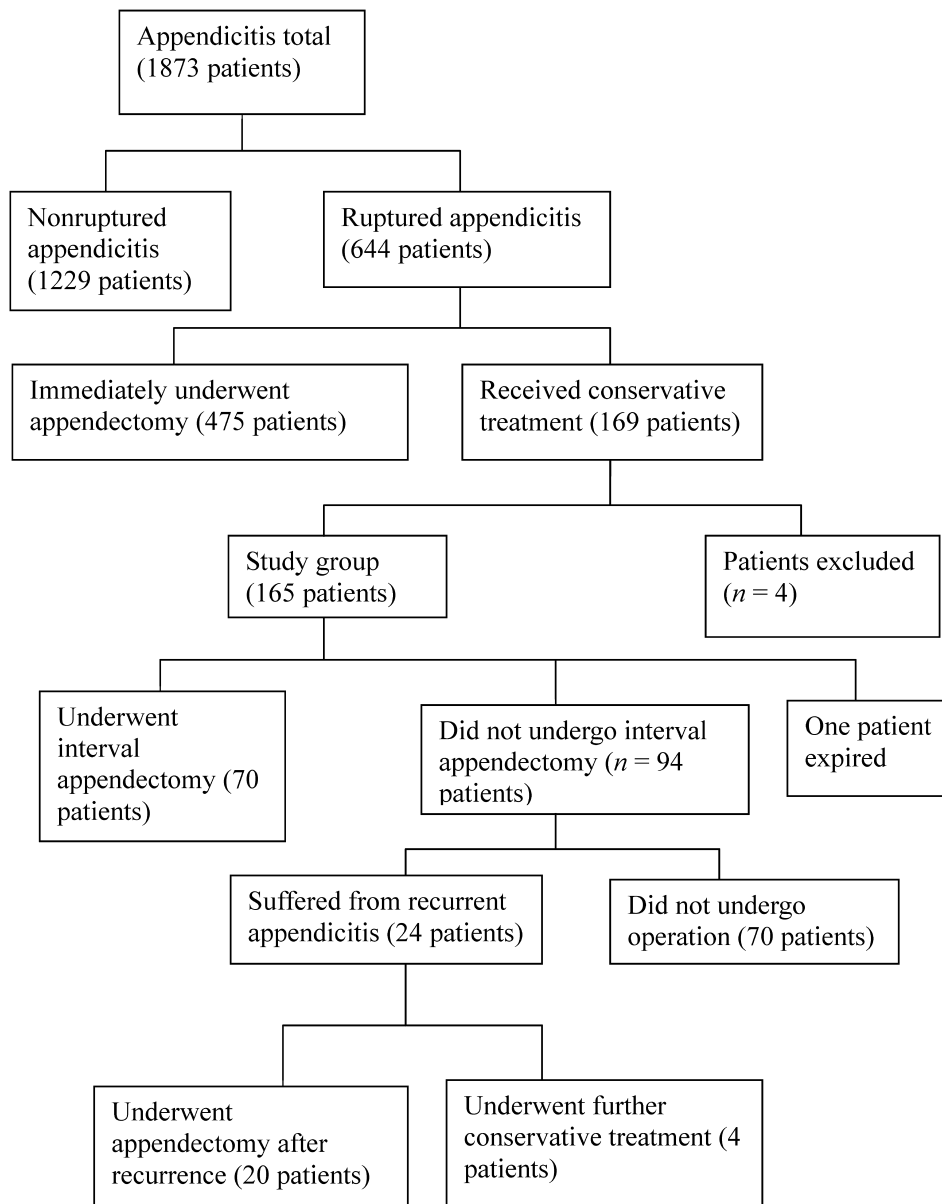


Figure 1. Patient distribution.

patients was 33 months (range 3–78 months, SD 20) (Fig. 1).

Admission hospital stays for those who underwent appendectomy before (interval appendectomy group) or after (recurrence/then operation group) the recurrence of appendicitis were compared. The duration of the first admission hospital stay was 9.57 ± 5.53 days for the interval appendectomy group (IA group) and 9.40 ± 4.59 days for the recurrence/then operation group ($P = 0.903$). The duration of the second hospital stay was 4.43 ± 3.32 days for the interval appendectomy group and 6.75 ± 5.74 days for the recurrence/then operation group ($P = 0.023$) (Table 1). The complication rate was 7/70 (10%) for the interval appendectomy group and 2/20 (10%) for the recurrence/then operation group ($P = 1.0$).

The rate of recurrent appendicitis was 25.5% (24/94). Of these 24 recurrences, 20 (83.3%) occurred during the first 6 months (Fig. 2). Among those recurrences, 9 (9/24, 37.5%) occurred before 6 weeks, 6 (6/24, 25%) occurred between 6 and 12 weeks, and 9 (9/24, 37.5%) occurred after 12 weeks.

Pathology

The pathologies of those who had undergone an interval appendectomy (70 patients), were acute appendicitis (18%), chronic appendicitis (50%), lymphoid hyperplasia (16%), granulomatous inflammation (4%), fibrous obliteration (2%), neoplasm (2%), and mucinous

Table 1.
Comparison of hospital stays between interval appendectomy group and recurrence/then operation group

Admission	Interval appendectomy (n = 70)	Recurrence/then operation (n = 20)	P
First (days)	9.57 ± 5.53	9.40 ± 4.59	0.903
Second (days)	4.43 ± 3.32	6.75 ± 5.74	0.023*

Results are means ± SD.

*P < 0.05.

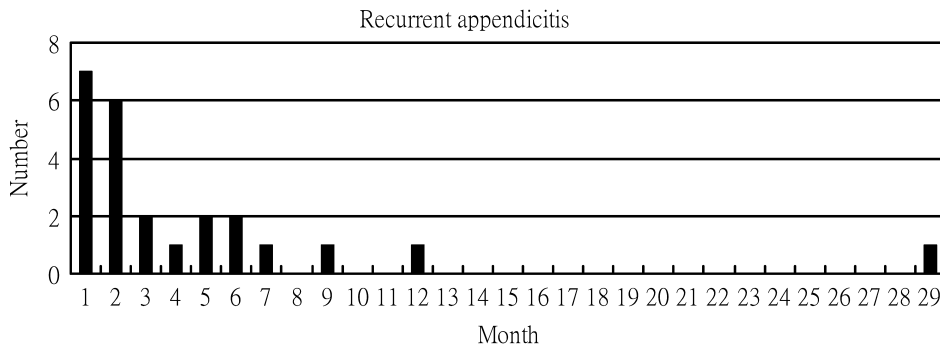


Figure 2. Recurrence of appendicitis after conservative treatment of an appendiceal mass.

Table 2.

Revised diagnosis of appendiceal mass (n = 165)

Revised diagnosis	No.
Colon cancer	5
Diverticulitis	5
Mucinous tumor/mucocele	3
Urachal abscess	1
Tuboovarian abscess	1
Xanthogranuloma change	1
Epithelial hyperplasia	1
Total	17 (10.3%)

change (8%). The pathologies of those underwent appendectomy after recurrence (20 patients) were acute appendicitis (55%), chronic appendicitis (20%), lymphoid hyperplasia (10%), neoplasm (10%), and mucinous change (5%). Of the 165 patients, 10.3% had their diagnosis changed after survey or surgery (Table 2). Five (3.03%) were found to have colon cancer upon follow-up.

DISCUSSION

An appendiceal mass is the end result of a walled-off appendiceal perforation. Pathologically, it may present in a spectrum of severity, ranging from phlegmon to abscess¹ (the latter is more frequently encountered: 84.3–88.5%).^{13,14} The incidence of an appendiceal mass is about 2% to 10%, depending on the literature.^{10,12,15,16} This wide discrepancy is probably due to the diagnostic criteria used. With the advances in imaging studies,

including US and CT scans, similar results can be studied and compared.

The success rate of conservative treatment for an appendiceal mass ranges from 76% to 97%.^{3,6,14,17} CT- or US-guided drainage of abscesses has made surgical drainage necessary less frequently.^{1,14,18} Most of the phlegmon respond to conservative treatment, and drainage is almost never needed.¹⁸ Abscesses can also be treated conservatively without drainage, with only 58% needing US-guided drainage.¹⁴ Around 6% of appendiceal abscesses require surgical drainage, especially those with multifocal abscess formation or persistent pus discharge despite previous US- or CT-guided drainage. The flow chart for the management of an appendiceal mass is shown in (Figure 3).

The reported incidence of recurrent appendicitis after conservative treatment of an appendiceal mass ranges from 0% to 20%.^{1,6–8,11,13,18} The danger of recurrence is reported to be greatest during the first 6 months after the initial episode and minimally after 2 years.⁸ Our study showed that the recurrence rate of appendicitis was 25.5%. This figure was not high enough to suggest the use of interval appendectomy routinely but not low enough to overlook the benefit of interval appendectomy. Within the time-frame of recurrences, 37.5% occurred before 6 weeks, 25% occurred between 6 and 12 weeks, and the remaining 37.5% occurred after 12 weeks. Hence, interval appendectomy performed 12 weeks after discharge could prevent only 37.5% of the recurrences. The benefit is less than 16% (25.5% × 62.5%) if appendectomy is performed 6 weeks after discharge and less

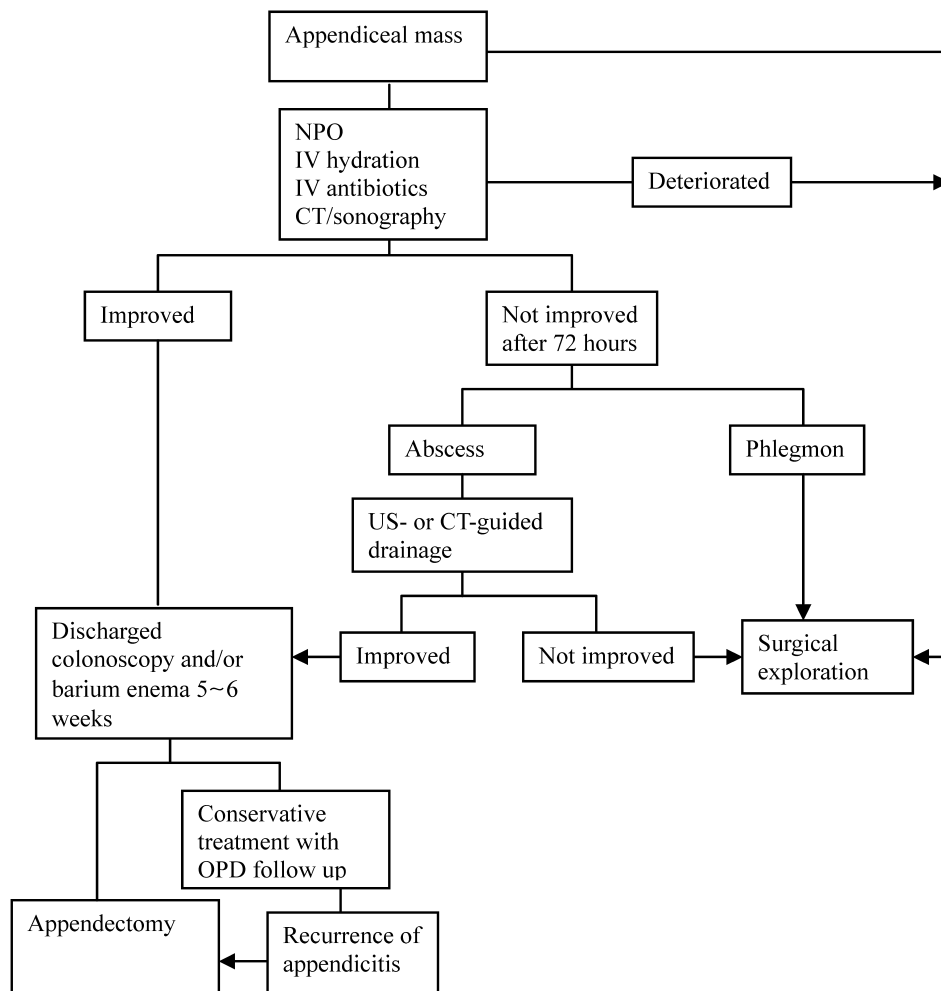


Figure 3. Flow chart for management of an appendiceal mass. Patients with an appendiceal mass are treated conservatively with intravenous fluid hydration, empiric antibiotics, and nothing per os. US- or computed tomographic (CT)-guided drainage or fluid aspirations are performed if the abscess fails to respond to antibiotic treatment within 3 days. If the patient's condition improves, he or she can be discharged and changed to outpatient department follow-up. If the condition deteriorates, surgical exploration should be performed. Colonoscopy or barium enema is suggested for evaluation of the underlying etiology, such as diverticulitis or coexistent colon cancer. In asymptomatic patients, outpatient department follow-up is adequate. If there is a recurrence, patients are advised to undergo appendectomy. NPO: nothing per os; IV: intravenous; US: ultrasonography; OPD: outpatient department.

than 10% (25.5% × 37.5%) after 12 weeks. This figure may be disappointing to those who suggest routine interval appendectomy for the prevention of recurrent appendicitis. Hoffmann *et al.*, suggested that routine elective appendectomy could be safely omitted in more than 80% of patients.⁸

The morbidity rate for interval appendectomy ranges from 3.4% to 19.0%^{4,6,10,12,13,19} (Table 3). Our complication rate for interval appendectomy was 10%. The complication rate among patients undergoing appendectomy before interval appendectomy or after the recurrence of appendicitis was no "difference" in our study. The duration of the hospital stay during the second admission was longer for those whose appendectomies were performed after the recurrence than for the interval appendectomy group. This longer hospital stay may be related more to the age of patients in the recurrence/then appendectomy group (the mean age was 57.9 years in the recurrence/then operation group versus 50.1 years in the interval appendectomy group). Based on the complication rate and hospital stay, we did not see apparent

benefit of appendectomy performed before the recurrence of appendicitis (interval appendectomy) compared with appendectomy performed after recurrence.

Another important issue is the cost-effectiveness of interval appendectomy after conservative treatment of an appendiceal mass. We had performed this cost-effectiveness study between watchful waiting versus interval appendectomy for patients who recovered from acute appendicitis with tumor formation.²⁰ Our cost-effectiveness analysis indicated that it was not economic to perform an interval appendectomy routinely. An additional 38% is added to the medical cost if interval appendectomy was performed routinely than when appendectomy was performed after a recurrence of appendicitis.

The incidence of other diseases labeled initially as an appendiceal mass has been reported to be up to 12%.^{4,8,21} These misdiagnosed lesions include ruptured cecal diverticulitis, regional ileitis, tuboovarian abscess, mesenteric tumors, carcinoid of the appendix, and cecal cancer.^{4,21} However, the main concern is the cecal cancer that presents as an inflammatory appendiceal mass.

Table 3.
Summary of previous literature

Study	Year	No.	Incidence of appendiceal mass	Recurrence rate	Morbidity of IA	Mortality	Comment on IA
Barnes ¹⁵	1962	251	251/7810 (3%)			33/251 (13%)	IA not routinely suggested
Engkvist ⁷	1971	45		3/43 (7%)	2/15 (13%)		IA not routinely suggested
Thomas ¹⁰	1973	37	37/538 (7%)	2/37 (5%)	3/34 (9%)		IA suggested
Bradley ¹²	1978	68	68/2621 (2%)	1/13 (7.6%)	19%	2/68 (3%)	IA suggested
Foran ¹¹	1978	43		20%		1/30 (3%)	
Mosegaard ⁴	1979	79		0/7	9/70 (13%)		IA not routinely suggested
Paull ¹³	1982	61		2/42 (5%)	4/32 (13%)	1/61 (1.6%)	IA not routinely suggested
Skoubo-Kristensen ⁶	1982	202		12/170 (7%)	6/179 (3%)	1/202 (0.5%)	IA suggested
Hoffmann ⁸	1984	59		9/44 (20.5%)		1.7%	IA not routinely suggested
Bagi ¹⁸	1987	40		8%	16%		IA not routinely suggested
Eriksson ¹⁹	1998	38			5/38 (13%)		IA not routinely suggested
Yamini ¹⁴	1998	66		4%	10%		Laparoscopic IA suggested
Willemssen ¹⁶	2002	233	233/2325 (10%)		36/205 (17%)		IA not routinely suggested

IA: interval appendectomy.

In our study, 17 patients (10.3%) had a change in diagnosis after survey or surgery, including five diagnoses of colon cancer. These five patients (3.03%) were found after surgery or during follow-up (range 0.6–53.4 months). The risk of overlooking a malignant tumor in the cecal region is the main reason to recommend interval appendectomy. About 1% to 4% of appendiceal abscesses have been associated with cecal or ascending colon cancer.^{4,7,17} The condition of the colon could be examined by colonoscopy or barium enema. Patients over the age of 40 should undergo colonoscopy or barium enema after resolution of the appendicitis with abscess formation, if only to exclude other possible maladies such as colon cancer or diverticulitis.^{4,22}

It is difficult to define the role of interval appendectomy after conservative treatment of an appendiceal mass. A recent survey conducted with consultants and specialist registrars in general surgery in the Mid-Trent region showed that physicians had differences of opinion on the management of an appendiceal mass in different scenarios.²³ Appendectomy (interval or emergency) is practiced by 75% of general surgeons in the Mid-Trent region, with less than 25% managing an asymptomatic appendiceal mass without interval appendectomy. It seems that specialist registrars appear more likely not to offer patients interval appendectomy after conservative management. Based on our study and the literature, interval appendectomy did benefit a substantial group of patients but was not routinely necessary or cost-effective. We suggest that symptoms of right lower quadrant abdominal pain, signs of recurrent appendicitis, imaging findings of an appendicolith in the appendix, anxiety about recurrence, living a long distance from a surgical facility, or occupational needs

(*e.g.*, a fisherman) are indications for interval appendectomy. Otherwise, asymptomatic patients could just undergo follow-up without a scheduled interval appendectomy until the appendicitis recurs.

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