Outcomes of Percutaneous Drainage vs. Antibiotic Therapy Alone or Emergency Surgery in Periappendiceal Abscess

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ABSTRACT

Objective: To compare the treatment outcomes in patients with periappendiceal abscess who underwent percutaneous drainage, antibiotics therapy alone, or emergency surgery in a single hospital.

Methods: From January, 2013 to December, 2018, a retrospective cohort study was done in 124 patients who were diagnosed as periappendiceal abscess or phlegmon by CT scan in Siriraj Hospital, Bangkok. We evaluated patients' demographics, the abscess characteristics, and the outcomes of treatment including one of the three therapeutic options: image-guided percutaneous drainage, antibiotics alone, or emergency surgery.

Results: Among 124 patients, 44 (35.5%) underwent percutaneous drainage, 57 (46.0%) were treated with antibiotics alone, and 23 (18.5%) underwent emergency surgery. The percentages of patients with successful outcomes were 84.1% in percutaneous drainage, 98.2% in antibiotics treatment alone, and 95.7% in surgery. Antibiotics treatment alone was significantly associated with more successful outcome, with odds ratio (OR) of 9.882 (95% CI 1.162-84.066; P value 0.036), as compared with percutaneous drainage, while surgery showed no significant difference. The length of stay in the percutaneous drainage group (median of 10 days, minimum or maximum of 3 or 67 days) was significantly longer than the antibiotics group (median of 6 days, minimum or maximum of 1 and 53 days) with a P value of 0.008.

Conclusion: The antibiotics treatment alone was significantly associated with more successful outcome and shorter hospital stay than percutaneous drainage in patients with a periappendiceal abscess or a phlegmon. We suggest percutaneous drainage in the patients with larger sized abscess and show no improvement after antibiotics treatment.

Keywords: periappendiceal abscess; phlegmon; percutaneous drainage (Siriraj Med J 2021; 73: 10-16)

INTRODUCTION

Perforated appendicitis resulting in periappendiceal abscess occurs approximately 20% in patients with acute appendicitis and often causes morbidity.[1] A contrast-enhanced computed tomography (CT) scan is a diagnostic tool that can evaluate the feasibility of percutaneous abscess drainage and can guide the access route of drainage, either transabdominal or transgluteal approach.[2]

There is no definite treatment guideline for these group of patients, either conservative management (antibiotic therapy alone or antibiotics combined with percutaneous drainage) or emergency surgery.[3]

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Percutaneous drainage with intravenous (IV) antibiotics in periappendiceal abscess is an effective and minimally invasive treatment.[4-9] However, some patients develop complications after percutaneous drainage leading to prolonged hospitalization or emergency appendectomy. An algorithm for the management of periappendiceal abscesses indicated that, if there is diffuse peritonitis, the patient should undergo immediate surgery. But if there is no peritonitis, the feasibility of percutaneous drainage should determine the management.[2]

Objectives

The purpose of this study was to compare the outcomes of patients with periappendiceal abscess or phlegmon who were treated by percutaneous drainage, antibiotics alone or emergency surgery, in our university hospital.

MATERIALS AND METHODS

Patient selection

The study protocol was approved by the Institutional Review Board (IRB) of Siriraj Hospital, Mahidol University (Si 423/2019). We retrospectively analyzed all patients who were diagnosed as periappendiceal abscess based on CT findings and confirmed by the patients' discharge summary from January, 2013 to December, 2018. Those patients underwent one of these three treatment options: ultrasound (US) or CT-guided percutaneous drainage, IV and oral antibiotics therapy alone, or surgery. The treatment choice was judged individually by the referring physicians based on the patients' imaging findings. All patients had been treated with antibiotics before and after drainage/surgery until complete course. The patients were classified as percutaneous drainage group if drainage was done within three days after the diagnosis, as recommended by Richmond.[2] The feasibility of drainage was decided by on-call interventional radiologists.

Among a total of 137 patients whose CT showed periappendiceal abscess or phlegmon, ten patients were excluded due to being transferred to other hospitals. Three were excluded because their final pathological diagnoses resulted in appendiceal or cecal tumor. The remaining 124 patients were included in our study.

Preprocedure CT

A diagnostic CT scan (120 kVp; 300 mA; section thickness, 1.25 mm; pitch, 1.735:1) was conducted on a 64-slice CT scanner (GE Light speed VCT), (GE Discovery), and a 256-MDCT (GE revolution CT). Intravenous contrast-enhanced CT (non-ionic iodinate contrast media 350 mg I/ml) was performed with a dose of 2 ml/kg. and an injection rate of 3 ml/second.

Data collection

The demographic data, abscess characteristics, time interval between percutaneous drainage and surgery, and type of surgical procedures were all recorded.

A periappendiceal abscess is defined as a fluid collection adjacent to the appendix, which has an attenuation of 0-20 Hounsfield units (HU) on CT scan. A phlegmon is defined as an area measuring 20 HU or greater within the periappendiceal fat.

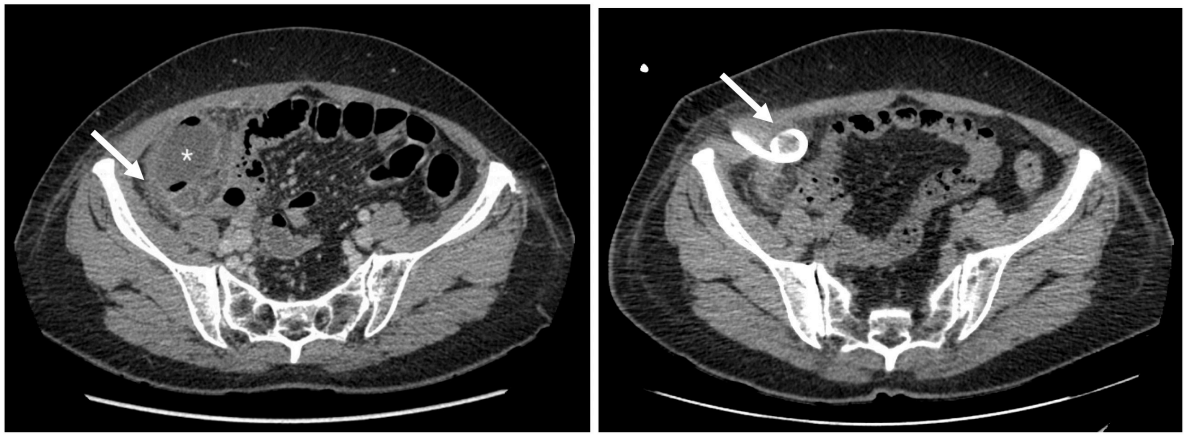
We graded abscess based on Jeffrey, et al.'s classification system.[10] Grade 1 is defined as periappendiceal phlegmon or abscess smaller than or equal to 3 cm. Grade 2 is a well-circumscribed periappendiceal abscess larger than 3 cm. Grade 3 is a large, poorly defined periappendiceal abscess extending to a distant location (pelvic cavity or interloop spaces) and multiple abscesses.

Percutaneous drainage procedures were performed by four experienced interventional radiologists. The details of each procedure are shown in Table 1. The sizes of the catheter (SKATER™ Drainage System, ARGON Medical Devices, Athens) were between 8-12 Fr, depending on the viscosity of the aspirated fluid. Almost all access routes were transabdominal (Fig 1); only one patient had transgluteal route.

TABLE 1. The detail of percutaneous abscess drainage procedures.

Variables	n = 44
Image guidance	
CT guided	8 (18.2%)
US guided	11 (25.0%)
CT and US guided	25 (56.8%)
Technical approach	
Transabdominal	43 (97.7%)
Transgluteal	1 (2.3%)
Catheter size (Fr)	
8 Fr	12 (27.3%)
10 Fr	26 (59.1%)
12 Fr	6 (13.6%)

Data are expressed as number (percentage)



A B

Fig 1. Grade 2 abscess in a 58-year-old female with abdominal pain and diarrhea for 1 week.
(A) Contrast CT showed a well-circumscribed periappendiceal abscess, size 6.1x3.5 cm. with internal air bubbles *(asterisk)* at right lower abdomen. **(B)** The patient underwent percutaneous transabdominal drainage of abscess. Follow up CT showed resolution of the abscess. Note the drainage catheter *(arrow)*

A successful outcome for percutaneous drainage is defined as the patient recovering after a single drainage by decreasing fluid output (less than 10 ml/day x 3 consecutive days), with a follow-up CT and/or US showing a decreasing size of the abscess, and the patient being discharged from the hospital without surgery. Percutaneous drainage failure is defined when clinical worsening after drainage and need urgent surgery. The patients who later had elective surgery were not classified as percutaneous drainage failure. A successful outcome for antibiotics treatment is defined as the patient's clinical improvement and/or follow-up imaging shows abscess resolution, and the patient being discharged after IV antibiotics given for seven days.[2] A failed outcome for antibiotic treatment alone are a clinically worsening after treatment and need further percutaneous drainage or urgent surgery. A successful outcome for surgery is defined as patient recovery after a surgery and can be discharged from the hospital. After the first surgical procedure, if a patient required re-admission for antibiotics treatment, percutaneous drainage, or re-surgery, it is defined as surgical failure outcome.

The antibiotic protocols in our hospital were Ceftriaxone, 2 grams IV OD, with Metronidazole; 500 milligrams IV q 8 hours; or Piperacillin/ Tazobactam, 4.5 grams IV q 8 hours for 5-7 days. In the percutaneous drainage group and the surgery group, IV antibiotics were continued after drainage/surgery until 14 days. After discharge from the hospital, all patients received oral antibiotics: Cefdinir, 200 milligrams PO q 12 hours, with Metronidazole, 400 milligrams PO q 8 hours for 7 days.

Statistical analysis

Data were prepared and analyzed using PASW Statistics 18.0 (SPSS Inc., Chicago IL USA). Patients' clinical characteristics were summarized as median (minimum, maximum) for quantitative variables, while numbers and percentages were summarized for qualitative variables. The Mann-Whitney U test was used to compare quantitative variables between the successful and failed groups. The Pearson Chi-square test or Fisher's Exact test was used to compare the qualitative variables between the groups. Backward conditional-binary logistic regression was used to adjust any confounding variables between the treatment and the outcome.

RESULTS

Among 124 patients, 68 were male (54.8%) and 56 were female (45.2%), with a mean age of 53 (a range from 7-93 years). Symptoms onset until admission was 1-30 days (a mean of 5 days).

We categorized the patients into three groups according to the treatment options: 44 people (35.5%) underwent percutaneous drainage; 57 (46.0%) were treated with antibiotics alone, and the remaining 23 patients (18.5%) underwent emergency surgery. The characteristics of the abscesses in each group are shown in Table 2. The abscess size was largest in the percutaneous drainage group (a median size of 6.0 cm.), which had statistically significant difference as compared with the antibiotics-alone and surgery groups.

For the abscess grade, a Grade 1 abscess was found least frequently in the percutaneous drainage group, as compared to the other two groups, with a statistical

TABLE 2. Comparison of patients' demographics and characteristics of abscess in each treatment option; percutaneous drainage, antibiotic (ATB) therapy alone and surgery alone.

Variables	Percutaneous drainage (n = 44)	ATB alone (n = 57)	Surgery (n = 23)	P-value
Abscess size (cm)	6.0 (2.5, 12.3)	3.7 (0.9, 12.0)	3.6 (0.9, 11.0)	<0.001
Abscess grade				
Grade 1	2 (4.5%)	17 (29.8%)	6 (26.1%)	0.005[a,b]
Grade 2	29 (65.9%)	35 (61.4%)	14 (60.9%)	0.875
Grade 3	13 (29.5%)	5 (8.8%)	3 (13.0%)	0.019[a]
Number of abscess				0.173
Single	35 (79.5%)	52 (91.2%)	18 (78.3%)	
Multiple	9 (20.5%)	5 (8.8%)	5 (21.7%)	
Phlegmon	0 (0.0%)	21 (36.8%)	1 (4.3%)	<0.001
Abscess location				0.021
Right lower quadrant	32 (72.7%)	53 (93.0%)	18 (78.3%)	
Extend to distant location	12 (27.3%)	4 (7.0%)	5 (21.7%)	
Extraluminal air	27 (56.2%)	10 (20.8%)	11 (22.9%)	<0.001
Appendicolith	7 (28.0%)	9 (36.0%)	9 (36.0%)	0.043
Small bowel obstruction	2 (40.0%)	1 (20.0%)	2 (40.0%)	0.352
Length of stay (days)	10 (3, 67)	6 (1, 53)	6 (2, 16)	0.008
Recurrent appendicitis	1 (2.3%)	3 (5.3%)	0 (0.0%)	0.438

Data are expressed as number (percentage), median (minimum, maximum)
[a]=Percutaneous drainage and ATB alone, [b]=Percutaneous drainage and surgery

difference (P value 0.005). A Grade 2 abscess was found most frequently in every group, with no statistically significant differences (P value 0.875). A Grade 3 abscess was significantly found much more in the percutaneous drainage group than in the antibiotics-alone group (P value 0.019). The number of abscesses was single more than multiple in every group, with no significant difference. Phlegmon was found most frequently in the antibiotics-alone group. The length of stay for the percutaneous drainage group was significantly longer than for the antibiotics and surgical group.

The successful and failed outcomes for each treatment modality are summarized in Table 3. One patient who failed antibiotics treatment alone underwent appendectomy 15 days later. Another patient had a 6-cm intra-abdominal collection post-surgery but was successfully treated with antibiotics. After adjusting the confounding variables (abscess grade, location, phlegmon, extraluminal air, appendicolith, and length of stay), the results showed that the antibiotics-alone group had a significantly more successful outcome, with an OR of 9.882 (95% CI 1.162-84.066; P value 0.036) while the surgery group had no significance, with an OR of 4.529 (95% CI 0.521-39.386; P value 0.171), as compared with the percutaneous drainage group.

Total of 124 patients, 65 (52.4%) had an imaging follow-up either CT and/or US and 59 (47.6%) had no imaging follow-up. For the antibiotics-alone group, 26/57 (45.6%) had CT and/or US follow-up. For the percutaneous drainage group, 36/44 (81.8%) had CT

and/or US follow-up before the catheter removal. For the surgical group, 5/23 (21.7%) had CT and/or US follow-up. Table 4 shows the outcomes after percutaneous drainage, indications and types of surgery. The majority of patients with a successful outcome after percutaneous drainage did not undergo surgery (31/44, 70.5%), but 6/44 (13.6%) had an interval appendectomy.

DISCUSSION

Perforated acute appendicitis resulting in periappendiceal abscess can cause major morbidity. The definite treatment guidelines for this disease remain controversial. In our study, we divided patients who were diagnosed as ruptured appendicitis with periappendiceal abscess or phlegmon into three groups by the treatment options: percutaneous drainage, antibiotics therapy alone, or emergency surgery. In a study by Marin, et al.[4], percutaneous drainage in patients with perforated acute appendicitis had high clinical and technical success rates up to 90% (37 of 41 patients), with no procedure-related complications. Similar to our study, there was a high successful outcome in percutaneous drainage treatment, 37 out of 44 patients (84.1%), and 56 out of 57 patients (98.2%) who were treated by antibiotics alone. Our study agreed with previous studies that percutaneous drainage resulted in good treatment outcome ranged from 78.6% to 100%.[5-8]

A meta-analysis by Anderson and Petzold[9] found that antibiotics treatment alone for periappendiceal abscess had a successful outcome in 93% of the cases, and percutaneous drainage was needed for only 20%. Furthermore, a study by Miftaroski et al.[11] found only

TABLE 3. Outcome within treatment options.

Choice	Successful outcome	Failure outcome
Percutaneous drainage (n = 44)	37 (84.1%)	7 (15.9%)
Antibiotics alone (n = 57)	56 (98.2%)	1 (1.8%)
Surgery (n = 23)	22 (95.7%)	1 (4.3%)

TABLE 4. Outcomes after percutaneous drainage.

Outcome	n = 44
Successful outcome	37 (84.1%)
Failure outcome	7 (15.9%)
Time from drainage to surgery (days)	42 (2-298)
Indications and types of surgery	
Interval appendectomy	6 (13.6%)
Exploratory laparotomy with drainage (Failed drainage)	3 (6.8%)
Hemicolectomy (Failed drainage)	4 (9.1%)
Surgery not done	31 (70.5%)

Data are expressed as number (percentage), median (minimum, maximum)

1 out of 15 patients (7%) who had initially successful treatment via combining antibiotics and CT-guided drainage for a perityphlitic appendiceal abscess had recurrent appendicitis. Similar to our study, the risk of recurrent appendicitis was very low as 1 out of 44 patients (2.3%) in the percutaneous drainage group and 3 out of 57 (5.3%) in the antibiotics-alone group, but with no statistical significance (P value, 0.438).

The purpose of our study was to retrospectively compare the outcomes of treatment in patients with periappendiceal abscess or phlegmon who underwent: percutaneous drainage, antibiotics therapy alone, or emergency surgery. Until recently, studies have mostly compared the treatment outcomes between two groups: immediate surgery and non-surgical treatment.[3,7,12] Those studies revealed a better outcome for the conservatively treated group, with a lower incidence of complications. Kim JK, et al.[3] compared the treatment outcomes between emergency operation and antibiotics groups, with or without percutaneous drainage. They showed a good outcome (91.7%) for the conservatively treated group. The only prospective, randomized, controlled trial study that compared the outcomes between percutaneous drainage group and antibiotics-only group was by Zerem et al.,[13] which included periappendiceal abscesses equal to or >3 cm in diameter. Those researchers concluded that percutaneous drainage with antibiotics treatment was more efficient than antibiotics alone because an appendectomy was less performed in the combined antibiotics and percutaneous drainage group than in the antibiotics-alone group.

In contrast to our study, after adjusting the confounding variables (i.e., abscess grade, location, phlegmon, extraluminal air/ appendicolith, and the length of stay), we found that antibiotics treatment alone was significantly associated with a more successful outcome, with an OR of 9.882 (95% CI 1.162-84.066; P value 0.036), as compared with the percutaneous drainage group. But surgery showed no statistical difference to percutaneous drainage, given its OR of 4.529 (95% CI 0.521-39.386; P value 0.171). As compared the successful outcomes among the three groups, antibiotics treatment alone had a successful outcome of 48.7% (56 out of 115 patients), while the percutaneous drainage group had a successful outcome of 32.2% (37 out of 115 patients), and the surgery group had a successful outcome of 19.1% (22 out of 115 patients). Our result is different from that of Zerem et al.[13] because we included patients who were diagnosed as phlegmon in 21 out of 57 patients (36.8%) in the antibiotics-alone group, but none of the patients were diagnosed as phlegmon in the percutaneous drainage group. Furthermore, patients with varying sizes of abscesses were included in our study. We found that the abscess size was largest in the percutaneous drainage group (median size of 6.0 cm.) as compare to the antibiotics-alone and surgical groups which (median size of 3.7 cm. and 3.6 cm. respectively) with a statistically significant difference (P value <0.001). It means that if the abscess is large (equal to or >6 cm), the clinician tends to choose percutaneous drainage as the treatment option rather than giving antibiotic alone or surgery.

Abscess size and grade are according to each other. Table 2 shows that a Grade 1 abscess (equal or <3 cm.) was found least frequently in the percutaneous drainage group, as compared to the other two groups, with a statistical difference. It represents the clinicians' preferring antibiotic or surgical treatment in cases of small sized abscess. In contrast to a Grade 3 abscess (a large abscess or multiple locations) which was significantly found much more in the percutaneous drainage group than in the antibiotics-alone group. It implies that the clinicians tend to consult percutaneous drainage in patients with large sized abscess. Because antibiotics therapy alone may not be effective to get rid of those abscesses and surgical technique may be more difficult in multiple abscesses leading to post-operative recurrence. For a Grade 2 abscess (>3 cm. but localize), which was found equally in every group, without significant differences. So, the choice of treatment in Grade 2 abscess should depend on clinical judgement either percutaneous drainage, antibiotic treatment or surgery.

The study by Zerem et al.[13] found that the length of hospital stay was significantly shorter in the percutaneous drainage group. But we found longer hospital stay in the percutaneous drainage group (a median of 10 days) than in the antibiotics group (a median of 6 days), with a P value of 0.008. This was due to the fact that some patients with post-percutaneous drainage were hospitalized until no drainage output or imaging follow-up showed abscess resolution, then the drainage catheters were removed before they were discharged.

The limitations in our study are that it's retrospective and has a single-center design. The patients' sample size in each group was rather small. Our result which indicated that antibiotics treatment alone was significantly associated with more successful outcome as compared with percutaneous drainage had an OR of 9.882 and very wide range of confidence interval (95% CI 1.162-84.066). Further research with more sample size is needed to make the results more reliable. Lastly, some of the patients had an incomplete clinical-data record, and approximately 50% of them did not have imaging follow-up.

CONCLUSION

The antibiotics treatment alone was significantly associated with more successful outcome and shorter hospital stay than percutaneous drainage in patients with a periappendiceal abscess or a phlegmon. We suggest percutaneous drainage in the patients with larger sized abscess and show no improvement after antibiotics treatment.

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