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ORIGINAL ARTICLE

Appendicular Abscess: Immediate Surgery or Percutaneous Drainage?

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ABSTRACT

Background: Appendicular abscess was found to be managed conservatively with good success rates and low incidence of complications. As emergency surgery is not always preferred, as it carries out risk of spread of inflammation within the abdominal cavity, adhesion of the intestines, sepsis after surgery, and delayed healing of surgical wounds. So, antibiotic treatments and ultrasound guided percutaneous drainage have been proven to be effective and safe.

Objectives: The aim of the work is to compare the results of immediate open surgical drainage versus image guided percutaneous drainage in the proper management of patients with appendicular abscess.

Methods: This prospective randomized study was carried out during the period between March 2018 to March 2019.

Results: The study included 40 patients was diagnosed as appendicular abscess, in the emergency unit, department of general surgery, faculty of medicine, Zagazig University. The mean age of the patients (N=40) was 33.5 years. And males to female's ratio was 65:35% in the open surgery group (n=20). While it was 50:50% in the conservative group (n=20).

Conclusion: Appendicular abscesses caused by complicated acute appendicitis may be treated by safe and effective manner; through US-guided percutaneous drainage with high technical and clinical success rates, low incidence of complications and shorter hospital stay.

Key words: Acute Appendicitis, Complete blood count, Computed Tomography, Laparoscopic Appendectomy, Surgical Site Infection, Trans Rectal.

INTRODUCTION

Appendicitis is the most common cause of acute abdominal pain requiring surgery, it may occur at any age, its overall rate ratio (11 per 10,000 populations per year). The highest incidence of appendicitis has been found in persons aged 15-30 years (23.3 per 10,000 populations per year) and it is relatively rare at the extremes of age. Males have higher rates of appendicitis than females (1.4:1). Geographic, racial and seasonal variations are also noted [1].

It was described and diagnosed in 1886 for the first time and appendectomy had performed by McBurney in 1894 as the first one. Since then; appendectomy has been established as the standard and the basic treatment for appendicitis [2].

Nevertheless, 2-7% of patients with infected appendix don't have simple appendicitis, but they have appendicitis that manifest itself with complex elements such as an abscess in the peri-appendix and right lower quadrant masses due to acute inflammation of meso-appendix and the surrounding structures, those patients have additional symptoms and signs plus the classical presentation of ordinary appendicitis [3].

Patients with appendicular abscess usually have severe colicky pain in the right lower abdomen (right iliac fossa) with a tender boggy swelling in the same site, accompanied by high grade fever with chills and rigors. Other symptoms may include constipation, vomiting or less frequently diarrhea [4].

When urgent operation is performed on such cases, there are many complications that may appear as: inflammation in large area within the abdominal cavity, adhesions of the intestine, postoperative sepsis and generalized peritonitis. These complications may lead to prolongation of post-operative hospital stay and increase post-operative morbidity and mortality [5].

Therefore, patients that suspected of having appendicitis associated with an abscess in the peri-appendix; instead of classical urgent surgery, the pattern has been to perform conservative treatment as ultrasound-guided percutaneous drainage with antibiotics treatment first and followed by an interval appendectomy after a certain time. Nonetheless, standard treatment protocols have not been established, so this issue is still controversial [6].

In addition, not the percutaneous drainage is the only procedure of conservative treatments; but also, the less invasive trans-rectal method or trans-vaginal technique, depends on the location of the appendicular abscess [7].

SUBJECTS AND METHODS

This prospective randomized study was carried out during the period between March 2018 to March 2019.

The study included 40 patients was diagnosed as appendicular abscess, in the emergency unit, department of general surgery, faculty of medicine, Zagazig University.

Inclusion criteria: patients with appendicular abscess above the age of 18 years old. Written consent was obtained from all participants.

Exclusion criteria:

- Generalized peritonitis and patients with signs of spreading infection; toxaemia and septicaemia.
- Multi-loculated appendicular abscess.
- Immunocompromised patients, hepatic dysfunction, renal impairment, uncontrolled diabetic patients and cardiac diseases.
- Patients refused to share in this study. Or lost during follow up.

All patients in the study were subjected to:

Pre-operative evaluation:

- Detailed history taking.
- Complete clinical examination (general – local).
- Laboratory investigations e.g. (CBC, liver function test, kidney function test, blood glucose level and coagulation profile).
- ECG for patients above 40 years old.
- Pelvic-abdominal ultrasound for all cases.
- CT scan of abdomen and pelvis for unclear and vague diagnosis by ultrasonography.

Operative design:

We divided those patients randomly into two groups:

Group (A): included 20 patients, managed by emergency open surgery.

Group (B): included 20 patients, managed by sonar-guided percutaneous drainage.

Open surgical drainage of group A:

We prepared the patients for surgery as follow: pre-operative fasting; 6 hours at minimum. Pre-operative IV fluid, antibiotics and analgesics as before. After preparation; 12 patients received general anesthesia and 8 patients had spinal anesthesia without complications. Determination of the type of anesthesia depended upon the age, sex, attitude, body weight and co-morbidity of the patients. The decision is taken by the anesthesiologist.

Mc Burney incision was done for all cases. All patients underwent extraperitoneal drainage of the appendicular abscess.

The surgical site was drained by a tubal drain through a separate incision. The main surgical incision was closed in layers with interrupted stitches for external oblique muscle, simple interrupted stitches to the fascia and skin.

The drain was monitored daily by recording amount, colour of discharge. Drain was removed after stoppage of pus discharge and no evidence of a residual collection by US.

Sonar guided percutaneous drainage of group B

Patients were anaesthetized by local infiltration anesthesia during the drainage procedure using Lidocaine Hydrochloride 2%.

Pre-anesthetic medication was by an analgesic drug (ketorolac 30 mg diluted IV) half an hour before interference or a sedative drug as (Diazepam 2-5 mg IV) that needed in four patients due to their anxiety.

The injection needle was inserted on the capsule of the abscess under US guidance, and then the local anesthetics were injected while the needle was being withdrawn.

The abscess was drained under US guidance using the Seldinger technique. Samples of the content

were taken for culture. Pigtail drain was inserted and then we fixed it in the skin.

Post-operative (intervention) evaluation:

For group (A): the surgical wounds were inspected and daily dressed. The drains were evaluated and recorded.

For group (B): during the planned visits; the consistency, the colour and the amount in the drains were estimated and recorded.

For both groups:

- Pelvi-abdominal ultra-sonographic examination was performed every other day or on demand.
- Complications such as wound infection, intestinal obstruction, ileus and residual pus collections were recorded.

The patients were followed as regard:

- Pain and fever resolving after drainage.
- Hospital stay in days.
- Post-operative morbidity and complications.
- Functional recovery.

Clinical success rate is calculated as follows:

For group A:

1. The ability for complete abscess drainage.
2. All symptoms are subsided.
3. Absence of complications or the need for another surgical intervention.

For group B:

1. The ability to insert a drainage catheter into the abscess cavity.
2. Complete evacuation of the abscess cavity.
3. All symptoms are subsided.
4. Absence of complications or the need for surgical evacuation.

Statistical analysis

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean ± SD, the following tests were used to test differences for significance; difference and association of qualitative variable by Chi square test (X2). Differences between quantitative independent groups by t test. P value was set at <0.05 for significant results & <0.001 for high significant result.

RESULTS

Patients of group A (open surgical drainage)

All patients of this group (100%) underwent appendicular Abscess drainage. Appendectomy was done for 18 patients (90%) and could not do appendectomy for 2 patients (10%) because of marked adhesions, possibility of intestinal perforation.

Patients of this group who underwent open surgical drainage and had operative & post-operative complications; we managed them as follow:

- Patients that did not perform appendectomy (N=2); they will follow up at outpatient clinic; for interval appendectomy after 4 months.
- Patients who had wound infection and serous discharge (N=11); they underwent pus and serous drainage, routine daily dressing and antibiotics treatment according to culture & sensitivity until complete resolution of infection.
- Patients who had wound dehiscence (N=3); underwent daily dressing for 10 days, then underwent secondary suturing.
- Patient who had paralytic ileus (N=1); underwent conservative treatment for 48 hours, then they showed improvement clinically.

Patients of group B (sonar guided percutaneous drainage)

After insertion of pigtail drain; 18 patients (90%) had successful insertion from the first time and repositioning of the drain was needed in 2 patients (10%) because of non-functioning drain as it inserted in a false position.

Patients of this group that had operative & post-operative complications; we managed them as follow:

- Puncture site bleeding (N=1): managed conservatively; by compression and did not show complications
- Failure of insertion of pigtail (N=2): they underwent re-insertion in a second attempt and showed successful drainage.
- Patient who had residual pus collection (N=1); this female patient (Age:36); did not show improvement in her symptoms and signs after sonar guided percutaneous drainage and there was a residual pus collection by ultrasound. She underwent open surgical drainage with successful and complete resolution.

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Table (1): Demographic data distribution. There was no significant difference between groups regarding age and sex.

			Conservative group B (N=20)	*Open surgery group A (N=20)*	*t/X²*	P
Age	*Mean ±SD*		*33.25±10.3*	*34.15±11.8*	*-0.208*	*0.836*
	Range		*19-55 Y*	*21-58 Y*		
Sex	*Male*	*N*	*10*	*13*	*0.92*	*0.33*
		%	*50.0%*	*65.0%*		
	Female	*N*	*10*	*7*		
		%	*50.0%*	*35.0%*		
Total		*N*	*20*	*20*		
		%	*100.0%*	*100.0%*		

Table (2): Examination distribution between the two studied groups There was no significant difference between both groups.

			Surgery		Total	X^2	P
			Conservative group B (N=20)	Open surgery group A (N=20)			
General appearance	*Non-toxic*	*N*	*14*	*8*	*22*	*3.63*	*0.057*
		%	*70.0%*	*40.0%*	*55.0%*		
	Toxic	*N*	*6*	*12*	*18*		
		%	*30.0%*	*60.0%*	*45.0%*		
Tenderness	*++*	*N*	*12*	*9*	*21*	*0.902*	*0.34*
		%	*60.0%*	*45.0%*	*52.5%*		
	+++	*N*	*8*	*11*	*19*		
		%	*40.0%*	*55%`*	*47.5%*		
Palpation	*Distention*	*N*	*0*	*2*	*2*	*4.8*	*0.18*
		%	*0.0%*	*10.0%*	*5.0%*		
	Lax abdomen	*N*	*4*	*2*	*6*		
		%	*20.0%*	*10.0%*	*15.0%*		
	Rebound tenderness	*N*	*10*	*12*	*22*		
		%	*50%*	*60%*	*55%*		
Total		*N*	*20*	*20*	*40*		
		%	*100.0%*	*100.0%*	*100.0%*		
Abscess size			***6.3±1.5***	***6.7±3.4***		***0.25***	***0.065***

Table (3): Operative data distribution. Conservative group B; was significantly shorter in operation (intervention) time. The rate of successful drainage was better in the open surgical group A.

		Surgery		*Total*	*X^2*	*P*
		Conservative group B (N=20)	***Open surgery group A (N=20)***			
Operation(intervention) time	*Mean ±SD*	***15.45±3.54***	***25.65±5.65***		*4.258*	***0.00******

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			Surgery		Total	X^2	P
			Conservative group B (N=20)	Open surgery group A (N=20)			
Procedure (drainage of pus).	Success	N	18	20	38	2.6	0.64
		%	90.0%	100.0%	95.0%		
	Failure	N	2	0	2		
		%	10.0%	0.0%	10.0%		
Total		N	20	20	40		
		%	100.0%	100.0%	100.0%		

Table (4): Post-operative results distribution. conservative group B was significantly shorter in hospital stay and significantly lower regarding the rate of surgical (puncture) site infection.

			Surgery		Total	X^2	P
			Conservative group (N=20)	Open surgery group (N=20)			
Fever resolving	1 day	N	11	3	14	5.4	0.17
		%	55.0%	15.0%	35.0%		
	2 days	N	7	12	19		
		%	35.0%	60.0%	47.5%		
	3 days	N	1	5	6		
		%	5.0%	25.0%	15%		
	No resolving	N	1	0	1		
		%	5.0%	0.0%	2.5.0%		
Pain resolving	1 day	N	10	2	12	5.13	0.27
		%	50.0%	10.0%	30.5%		
	2 days	N	8	8	16		
		%	40.0%	45.0%	40%		
	3 days	N	1	10	11		
		%	0.0%	10.0%	27.5%		
	No resolving	N	1	0	1		
		%	10.0%	0.0%	2.5%		
Hospital stay	1 day	N	8	0	8	15.05	0.001**
		%	40.0%	0.0%	20.0%		
	2 days	N	10	2	12		
		%	50.0%	10.0%	60%		
	3 days	N	0	9	9		
		%	0.0%	45.0%	22.5%		
	`4 days	N	2	9	11		
		%	10.0%	45.0%	27.5%		
	Mean ±SD		(2.14±0.52)	(3.74±0.85)			
Surgical or puncture site infection	No	N	19	9	28	6.04	0.004*
		%	95.0%	45.0%	70.0%		
	Yes	N	1	11	12		
		%	5.0%	55.0%	30.0%		
Total		N	20	20	40		
		%	100.0%	100.0%	100.0%		

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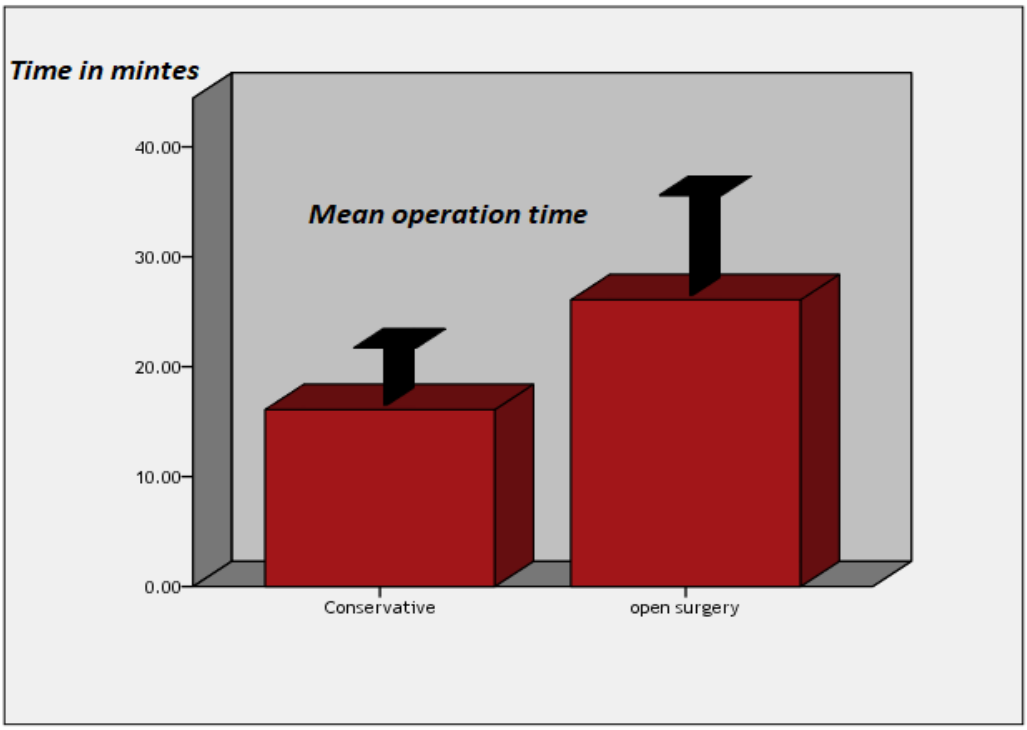

Figure (1): Operation (intervention) time distribution between the studied groups; conservative group showed significantly less intervention time.

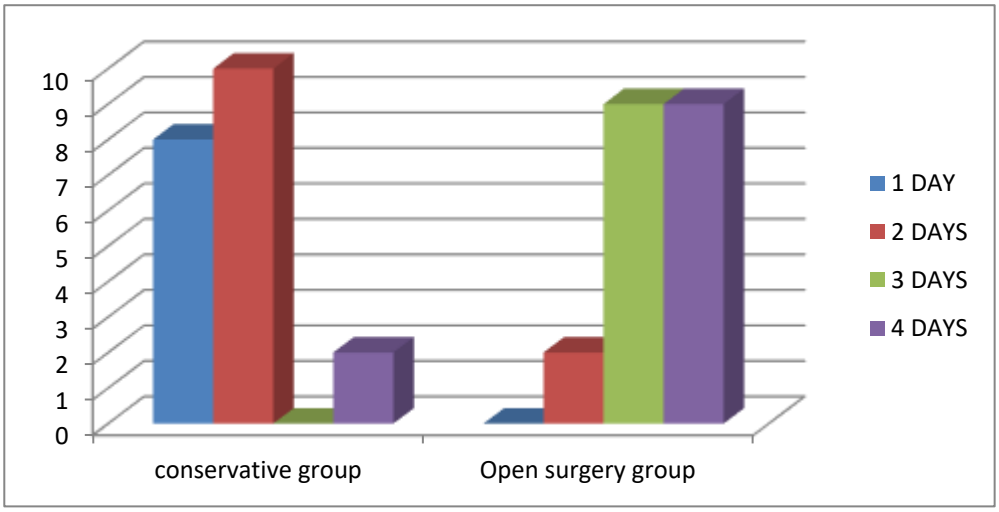

Figure (2): hospital stay distribution between the two studied groups. Group (B) was significant less in hospital stay than the open surgery group (A).

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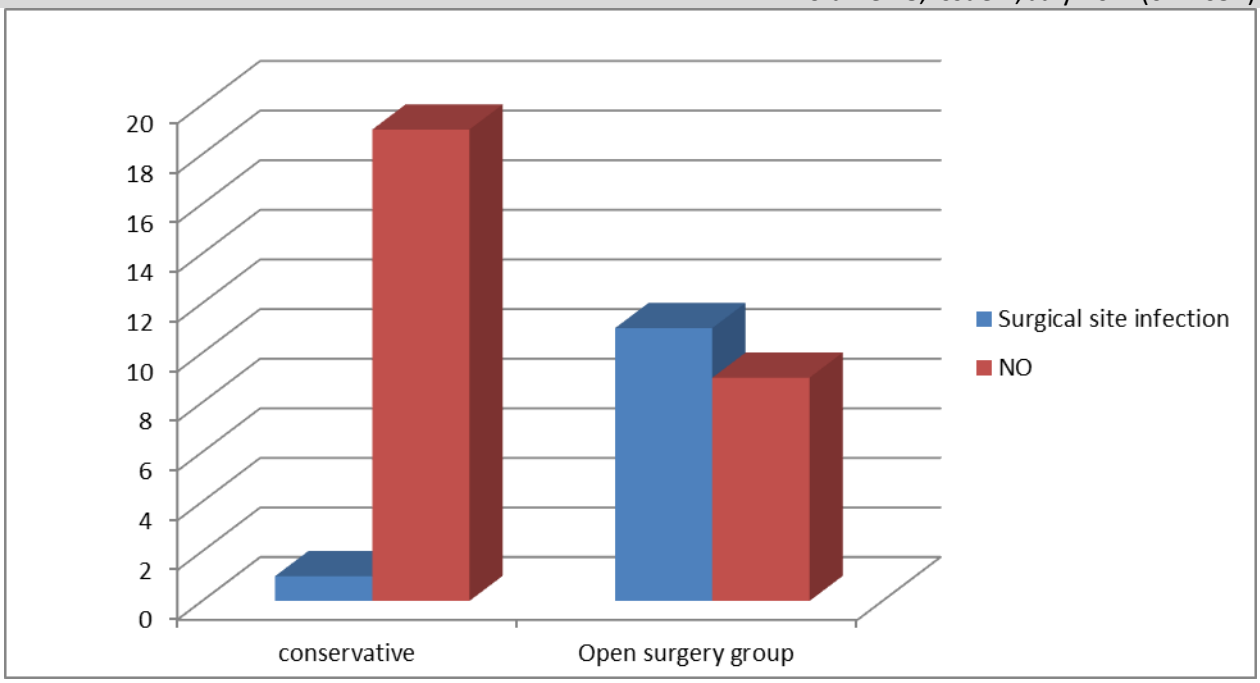

Figure (3): surgical site infection distribution. Conservative sonar guided percutaneous group (B) showed significant less rates of infection that group (A).

DISCUSSION

There is no clear standardized management for complicated appendicitis associated with abscess or phlegmon. The strategy of treatment is still surrounded with controversy; with a treatment varying from immediate appendectomy versus non-operative management as sonar guided percutaneous drainage with antibiotics and possible interval appendectomy [8].

Appendicular abscess accounts for 2-10% of appendicitis cases. It was found by numerous studies that when emergency surgery was performed during complicated appendicitis, the inflammation has spread to adjacent areas over a wide area, in addition; due to edema and vulnerability of the adjacent small and large intestine, secondary fistulas may occur. Therefore, the incidence of documented complications of emergency operation was up to 26% [9].

Furthermore, in emergency appendectomies; surgery may be technically difficult because of deformation of the normal anatomical structures. For those patients, instead of the routine steps of appendectomy; many cases may need right hemicolectomy [10].

The development of interventional radiological procedure has made percutaneous puncture and drainage of abdominal fluid collection possible. Image-guided percutaneous drainage of appendicular abscess has become well-established because of its proven safety and efficacy [11].

In our study, there was no significant differences between both groups regarding age and sex. Also, there was no differences between them regarding the clinical data of presentations and investigations. Moreover, there was no differences between both groups regarding vital signs and TLC on admission. Our pre-operative results were in agreement with the pre-operative data of ***Brown et al.*** they published their work in (2003) and studied one hundred and four patients with appendicular abscess**.** Their pre-operative results among both groups were similar regarding the age *(30.6± 12.3 Vs 34.8± 13.5 Y)*, gender (*61% Vs 62% male*). Admission WBC count was (*17.5± 5.1 Vs 17.5±4.8*). admission temperature was (*37.9± 1.2 Vs 37.8± 0.9*)**,** admission pulse was *(88.85±4.36 Vs90.45±3.65),* and symptomatically there was no differences between the studied groups [12].

We excluded the multi-loculated abscess from our study because the open surgical drainage is a must for these cases. The abscess size of both group of patients showed no differences. As it was *(6.7±3.4 cm)* in open surgical group(A) Vs *(6.3±1.5 cm)* in

conservative group (B), Aligned with our data; a retrospective study published in (2010) was performed on 76 patients with appendicular abscess by **Kim et al**; the size of abscess was an average *4.9 cm (range, 3.0 to 6.1 cm)* in emergency operation group (1), and it was an average *4.4 cm (range, 2.5 to 7.5 cm)* in conservative group (2) and they also excluded the multi-loculated or large abscess more than 10cm from their study to give justice in the comparison.

Factors predicting unfavorable outcome for percutaneous catheter drainage procedure are a large poorly defined appendicular abscess and presence of extra luminal appendicolith [11].

In the current study, post-operatively, we have found that the conservative management is better than emergency open surgical drainage, regarding short period of hospital stay, early functional recovery and less rates of post interventional morbidity and complications. Where the mean hospital stays for open surgical group A was ***(3.74±0.85),*** while in conservative group B, it was ***(2.14±0.52***). And functional recovery was ***(2.9±0.8)*** in group A, and it was ***(1.33±0.5)*** in group B, which had a significant difference**.**

In our study, post-operative complications of the open surgical group were relatively high; 11 patients (55%) showed wound infection, 3 patients (15%) had wound dehiscence, 2 patients (10%) showed serous discharge. On the other hand; the patients of conservative group; 1 patient (5%) showed puncture site bleeding; controlled by compression and showed no complications, 1 patient (5%) showed obstructed drain and dealt with flushing and washing out of the drain with sodium chloride; which worked again. And another patient (5%) showed residual pus collection and unresolved symptoms & signs. This patient underwent extra-peritoneal open surgical drainage with successfully.

The meta-analysis by ***Andersson et al,*** [13]**,** compared surgical versus conservative therapy in 60 patients diagnosed with appendicular abscess, their results clarified that Immediate surgery is associated with a higher morbidity compared with nonsurgical treatment with $P < 0.001$. Our post-operative results are in agreement with these studies. Complications were significantly more frequent in the surgical group A.

Multiple factors play into the decision between ultrasound (US)- and CT-guided percutaneous abscess drainage. US avoids ionizing radiation and allows real-time observation throughout the procedure. CT is preferred if the abscess is near or obscured by vital structures. It is also preferred for smaller abscesses [9].

In this study; we did not work on the evaluation and assessment for the real need to interval appendectomy after non-surgical treatment of appendicular abscess; this issue needs more studies and hard work to assess it.

The reported recurrence rate after conservative treatments ranged from 5% to 37%. In studies showing relatively high recurrence rates, interval surgery to remove the risk of recurrence was recommended. On the other side, in a random prospective study that was conducted by **Kumar and Jain**; the recurrence rate of appendicitis in the group that underwent only observation without surgery after conservative management was 10%.

CONCLUSION

Appendicular abscesses caused by complicated acute appendicitis may be treated by safe and effective manner; through US-guided percutaneous drainage with high technical and clinical success rates, low incidence of complications and shorter hospital stay.

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