

## Original Article

# Management of Appendicular Mass; Comparative Study between Different Modalities

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## Abstract

In spite of its commonality, there is no universal standard in the management of appendicular mass. This study is a prospective one, aiming at comparing the different modalities of management in terms of efficacy and safety.

Over seven years, all patients presented with appendicular mass were involved in the study, where they were divided into four groups; conservative management with routine interval appendectomy (group A), conservative treatment without interval appendectomy as a routine (group B), operative interference at the initial admission (group C), & laparoscopic exploration (group D). The study assessed the efficacy, complications, difficulties encountered in operative groups, rate of recurrence, hospital stay, and durations of treatment.

169 cases were presented in this study. The conservative management was successful in about 88% patients Appendectomy was done in all patients of group A, C & D, and only 18% in group B need appendectomy, Appendectomy was done in two settings (drainage then appendectomy) in ~5% of group A, ~4% of group B, 14% of group C, and 27% of patients in group D. The hospital stay & duration of treatment were >2 folds more in conservative groups (A&B) than intervention groups (C&D). Difficulties in operations were reported more in intervention groups (c & d), where consultant was needed in all cases of group D, 2/3 of group B, and only 1/3 of group B & 7% in group A. There was no significant difference in operative difficulties between patient failed conservative measures and interventional group from the start (group C&D).

The study concluded that; although there is a debate in the best modalities of treatment of appendicular mass, the conservative approach is still a quite effective & safe method of treatment, with no significant operative difficulties in failed group. The rate of recurrence after successful conservative management is low to justify interval appendectomy as a routine. CT & or colonoscopy is preferred to be done after relief of acute attacks to avoid missing another pathology. The laparoscopic approach seem to be promising, with early recovery as well as diagnostic superiority for a hidden pathology. It may become the best modality with the growing of the learning curve.

**Keywords:** Appendicular Mass; Interval Appendectomy; Appendicitis

## Introduction

Acute appendicitis is still one of the most common surgical emergencies [1], with an annual incidence rate of about 0.1% inhabitants [2]. Up to 10% of these cases may develop appendicular mass [3]. In spite of its commonality, there is no universal standard in the management of the appendicular mass [1], with wide variable options to the extreme. Four modalities were reported in literature from the traditional conservative approach either with or without interval appendectomy as a routine to interventional approach either open and or laparoscopic during the initial admission [4]. This study is a prospective one, aims at comparing the different modalities of management in terms of efficacy and safety.

## Materials and Methods

Over seven years, all patients presented with appendicular mass were involved in the study. The diagnosis of the appendicular mass was made by clinical examination (acute painful tender mass in the

right iliac fossa as in Figure 1,2 usually associated with fever, malaise and anorexia.) and confirmed by ultrasound. Sometimes CT was used in the diagnosis as in Figure 3. The patients were divided into four groups. In group (A) the conservative management (Ochsner-Sherren regime [5] was applied with routine elective appendectomy after at least six weeks as a routine weather complaining or not. Group (B) conservative treatment was done without elective appendectomy as a routine. Group (C) operative interference at the initial diagnosis was the treatment chosen. Group (D) laparoscopic exploration was done at the initial management procedure.

In group A & B all patients followed Ochsner-Sherren regime initially, which included; Admission and nursing the patient in a popped-up position encouraging gravitational flow of any exudates towards the pelvis. Nothing is to be given by mouth for an initial 24-48 hours while the patient is kept on intravenous fluids, intravenous antibiotics (third generation cephalosporin), regular monitoring of vital sign a as well as local and general signs, and ultrasound follow

**Table 1:** Group A: cases with conservative management and routine interval.

No of Patients	Efficacy; Successful Failed	Difficulties encountered during appendectomy					Post Operative Complication	Hospital Stay (total)			Total Duration of Treatment		
		Time in (minutes)	Consultant	Complication	Appendectomy or Drainage	Other Diagnosis		C	O	T	C	O	T
1	succeed	60	No	No	Appendectomy	No	No	5	1	6	10	7	17
2	succeed	50	No	No	Appendectomy	No	No	4	2	6	10	5	15
3	succeed	50	No	No	Appendectomy	No	yes	5	1	6	9	7	16
4	succeed	45	No	No	one setting	No	No	6	1	7	14	10	24
5	failed	110	yes	No	Appendectomy		yes	3	7	10	3	18	21
6	succeed	100	yes	No	Appendectomy	No	No	4	1	5	12	5	17
7	succeed	35	No	No	Appendectomy	No	No	5	1	6	15	4	19
8	succeed	50	No	No	Appendectomy	No	No	6	1	7	13	3	16
9	failed	60	No	No	one setting	No	yes	3	4	7	3	16	19
10	succeed	40	No	No	Appendectomy	No	No	4	1	5	11	3	14
11	succeed	90	No	No	Appendectomy	No	No	4	1	5	10	4	14
12	succeed	80	No	No	Appendectomy	No	No	3	1	4	9	5	14
13	succeed	60	No	No	Appendectomy	No	No	2	1	3	12	3	15
14	succeed	70	No	No	Appendectomy	No	No	5	2	7	12	5	17
15	succeed	70	No	No	Appendectomy	No	No	4	1	5	10	7	17
16	succeed	85	No	No	Appendectomy	No	No	6	1	7	13	5	18
17	failed	60+70	yes	No	two setting	No	yes	4	5+3	12	22	8	30
18	succeed	90	No	No	Appendectomy	No	No	4	3	7	12	5	17
19	succeed	75	No	No	Appendectomy	No	No	4	1	5	14	7	21
20	succeed	60	No	No	Appendectomy	No	No	6	1	7	14	5	19
21	succeed	50	No	No	Appendectomy	No	No	7	1	8	15	5	20
22	succeed	40	No	No	Appendectomy	No	No	5	1	6	13	5	18
23	succeed	90	No	No	Appendectomy	No	No	4	2	6	16	6	22
24	succeed	45	No	No	Appendectomy	No	No	3	1	4	8	10	23
25	succeed	60	No	No	Appendectomy	No	No	4	1	5	14	3	17
26	succeed	50	No	No	Appendectomy	No	No	5	1	6	13	4	17
27	succeed	80	No	No	Appendectomy	No	yes	6	1	7	13	3	16
28	succeed	70	No	No	Appendectomy	No	No	6	1	7	14	3	17
29	succeed	75	No	No	Appendectomy	No	No	4	1	5	16	2	18
30	succeed	80	yes	No	Appendectomy	No	No	5	2	7	15	5	20
31	failed	70+60	No	No	two setting	No	yes	3	4+2	9	3	21	24
32	succeed	60	No	No	Appendectomy	No	No	3	1	4	10	5	15
33	succeed	70	No	No	Appendectomy	No	No	5	1	6	15	4	19
34	succeed	45	No	No	Appendectomy	No	No	5	1	6	14	4	18
35	succeed	40	No	No	Appendectomy	No	No	4	1	5	13	6	19
36	succeed	80	No	No	Appendectomy	No	No	3	2	5	13	5	18
37	succeed	80	No	No	Appendectomy		No	5	1	6	15	4	19
38	failed	50	yes	No	one setting	No	yes	2	5	7	2	14	16
39	succeed	60	No	No	Appendectomy	No	No	5	1	6	10	4	14
40	succeed	45	No	No	Appendectomy	No	No	3	1	4	10	3	13
41	succeed	60	No	No	Appendectomy	No	No	2	2	4	9	4	13
42	succeed	40	No	No	Appendectomy	No	No	6	1	7	13	5	18
		2530				No	No	5	1	6	16	4	20
	Successful in 37 (88%)	65 m (1hr)	3(7%) need consultant	0	Appendectomy in 100% 2(4.7%) in two stages	1(~2%) hidden diagnosis	4(9.5%) complication minor (SSI)			6d			18d

C; Conservative period, O; operative period, T; total duration

**Table 2:** Group B: Conservative management without routine interval appendectomy.

No of Patients	Efficacy; Successful Failed	Evidence of other Diagnostics	Recurrence	Difficulties encountered during operative cases				Hospital Stay (Total)	Total Duration of the Treatment
				Time in Minutes	Consultant	Surgical Interference	Complications		
1	Succeed	No	No					3	10
2	Succeed	No	Yes	70	yes	Appendectomy	No	3+2 (5)	18
3	Succeed	No	No			No		5	10
4	Succeed	No	No			No		6	13
5	Succeed	No	No			No		4	11
6	Succeed	No	No			No		4	14
7	Succeed	No	No			No		5	10
8	Succeed	No	No			No		3	8
9	Succeed	No	No			No		4	9
10	Failed	Cecal Mass (cancer)		150	No	Rt hemi-celotomy	No	2+10 (12)	22
11	Failed	No		120	No	Appendectomy	Yes	4+5 (9)	16
12	Succeed	No	No			No		6	11
13	Succeed	No	No			No		7	14
14	Succeed	No	No			No		8	13
15	Succeed	No	No			No		5	10
16	Succeed	No	No			No		4	11
17	Succeed	No	No			No		3	8
18	Succeed	No	No			No		5	10
19	Failed	No		100	No	Appendectomy	No	7	14
20	Succeed	No	No			No		4	10
21	Succeed	No	No			No		5	12
22	Succeed	No	No			No		4	11
23	Failed	No			Yes	Appendectomy	No	7	12
24	Succeed	No	No			No		3	10
25	Succeed	No	No			No		2	7
26	Succeed	No	No			No		4	11
27	Succeed	No	No			No		4	14
28	Failed	No		90+60 (150)		Drainage then Appendectomy		5+6+1 (12)	35
29	Succeed	No	Yes	120	No	Appendectomy	No	6+1 (7)	18
30	Succeed	No	No			No		6	11
31	Succeed	No	No			No		4	11
32	Succeed	No	No			No		4	14
33	Succeed	No	No			No		7	12
34	Failed	No		100		Appendectomy	No	2+5 (7)	17
35	Succeed	No	No		No	No		3	10
36	Succeed	No	No			No		5	15
37	Succeed	No	No			No		4	11
38	Succeed	No	No			No		8	13
39	Succeed	No	No			No		7	12
40	Succeed	No	No			No		3	10
41	Succeed	No	No			No		4	10
42	Succeed	No	No			No		4	10
43	Succeed	No	No			No		5	12

44	Succeed	No	No			No		7	14
45	Succeed	No	No			No		5	10
46	Succeed	No	No			No		6	11
47	Failed	No		100	Yes	Appendectomy	No	3+3 (6)	18
48	Succeed	No	No			No		4	11
49	Succeed	No	No			No		3	10
50	Succeed	No	No			No		5	14
51	Succeed	No	No			No		5	12
52	Succeed	No	No			No		6	13
53	Succeed	No	No			No		4	10
54	Succeed	No	No			No		4	10
55	Succeed	No	No			No		5	12
56	Succeed	No	No			No		5	12
57	Succeed	No	No			No		5	10
58	Succeed	No	Yes	70	No	Appendectomy	No	6+2 (8)	19
59	Failed	No	No	100	No	Appendectomy	No	3+7 (10)	17
60	Succeed	No	No			No		4	10
61	Succeed	No	No			No		3	10
62	Succeed	No	No			No		7	14
63	Succeed	No	No			No		7	12
64	Succeed	No	No			No		3	10
65	Succeed	No	No			No		5	10
66	Succeed	No	No			No		5	12
67	Succeed	No	No			No		4	9
68	Failed	No	No	110	No	Two settings	No	3+7 (10)	18
69	Succeed	No	No			No		6	13
70	Succeed	No	No			No		5	10
71	Succeed	No	No			No		6	12
72	Succeed	No	No			No		8	15
73	Succeed	No	No			No		7	14
74	Succeed	No	No			No		4	10
75	Succeed	No	Yes	70	No	Appendectomy	No	6	13
76	Succeed	No	No			No		5	10
77	Succeed	No	No			No		4	12
78	Succeed	No	No			No		6	14
79	Failed			80+70(150)	Yes	Drainage then Appendectomy	No	4+9+3 (16)	36
	69 (87%) Succeeded	1 (1.3%) wrong diagnosis	4/70 (~6%) Recurred	~ 110 minutes	4 (30%) need consultant	Appendectomy was done in 14 (18%) One setting in 11 & two setting in 3	One case (8%)	~5 days	~13 days

up. If the patient improved, he was allowed to start fluidly then semisolid diet, and discharged home. On the other hand, if patient not responding well or deteriorates, then the conservative management was curtailed and the patient was considered for operation.

The study compared the different modalities of management in terms of efficacy and safety. The safety was evaluated by assessment of occurrence of complications & difficulties encountered in operative groups (C,D), and failed patients in groups (A&B) that admitted for

operative explorations). We assessed the time of the operation, the need for a consultant & inability to remove the appendix in the same setting, as well as intraoperative mishaps, to give an idea about the difficulties. While in the conservative groups (A&B) the safety was evaluated by the failure rate, and difficulties encountered in operative interference in failed cases, the presence of other hidden diagnosis. On the other hand the efficacy was evaluated by the assessment the ability to provide definitive treatment and re need for medical care. Assessment of hospital stays & duration of treatment were also done.

**Table 3:** Group C: Cases with operative interference.

No of Patients	Difficulties encountered during the operation					Post-operative Complications	Hospital Stay	Duration of Treatment (In days)
	Time in (Minutes)	Consultation	Complications	Procedure	Other Diagnosis			
1	100	No	No	Appendectomy	No	No	5	10
2	110	Yes	No	Appendectomy	No	No	3	8
3	150	Yes	Yes	Appendectomy	No	Yes	2	9
4	95	Yes	No	2 settings	Yes	No	3	10
5	105	No	No	Appendectomy	No	No	4	12
6	110	No	No	Appendectomy	No	No	2	10
7	90	Yes	No	Appendectomy	No	No	4	11
8	110	Yes	No	Appendectomy	No	No	4	10
9	180	Yes	No	Appendectomy	No	Yes	3	10
10	60	Yes	No	Appendectomy	No	No	4	9
11	150	No	No	On 2 settings	No	No	4	11
12	120	No	No	Appendectomy	No	No	2	9
13	130	Yes	No	Appendectomy	No	Yes	5	10
14	70	No	No	Appendectomy	No	No	2	7
15	170	Yes	No	Appendectomy	No	No	4	12
16	125	Yes	No	Appendectomy	No	Yes	3	10
17	130	Yes	No	Appendectomy	No	No	5	12
18	90	Yes	No	On 2 settings	No	No	4	12
19	135	Yes	No	Appendectomy	No	Yes	2	10
20	120	No	No	Appendectomy	No	No	2	8
21	100	Yes	No	Appendectomy	No	No	4	12
22	160	Yes	No	Appendectomy	No	No	5	10
23	140	No	No	Appendectomy	No	Yes	3	8
24	105	Yes	No	On 2 settings	No	No	4	10
25	115	Yes	No	Appendectomy	Yes	No	2	11
26	80	No	No	Appendectomy	No	No	4	12
27	100	Yes	No	Appendectomy	No	No	3	12
28	70	No	No	Appendectomy	No	Yes	3	10
29	70	Yes	No	Appendectomy	No	No	2	9
	112 (2hr)	19 (66%) need consultant	1 (~3) mishaps intraoperative bleeding	Appendectomy in one setting in 25 (86%)	2 (7%) other diagnosis	7 (24%)	~3.5 days	10 days

Exclusion criteria include; patients presented initially with abscess (diagnosed clinically & or imaging study), & patients lost in follow up.

The average time of follow up was 3.5 years with a minimum two years.

## Results

One hundred and sixty nine (169) cases were presented in this study. Forty two cases involved in group A, seventy nine in group B, twenty nine cases in group C, and nineteen patients in group D.

Group A included forty two patients shown in Table 1. Conservative management was successful in 37 (88%) patients and failed in five cases (12%). One case (~2%) was mis-diagnosed as

appendicular mass and discovered during operative interference (after failure of conservative measures) to be iliocecal mass (proved to be GIST), where right hemi-colectomy was done. Surgical interference with appendectomy was done in five cases (12%) because of failure of conservative treatment. Two patients required two settings (drain then appendectomy) and three in one settings. The remaining cases (37) appendectomy was done as a routine after at least six weeks. The average total hospital stay in this group was six days and the average duration of medical treatment was about eighteen days. On reviewing the operative details; the average time was about one hours, consultant was needed in three cases (~7%). No intraoperative mishaps or complication was noted, but four cases (~9.5%) developed minor postoperative complications in the form of Surgical Site Infection (SSI) that treated medically.

**Table 4:** Group D: Cases with laproscopic interference.

No of Patients	Difficulties encountered during the operation						Post-operative Complications	Hospital Stay (Total)	Duration of Treatment (In days)
	Time	Consultant	Complications	Conversion	Procedure	Other Diagnosis			
1	90	yes	No	No	Appendectomy	No	No	2	8
2	100	yes	No	No	Appendectomy	No	Yes	3+2 (5)	16
3	80	yes	No	No	Drainage only	No	No	1	7
4	120	yes	No	No	Appendectomy	Yes	No	2	12
5	180	yes	No	No	Appendectomy	No	No	2	6
6	90	yes	No	No	Appendectomy	No	No	1	4
7	90	yes	No	No	Appendectomy	No	No	2	5
8	60	yes	No	No	Appendectomy	No	No	1	8
9	80	yes	No	No	Drainage only	No	No	2+2 (4)	13
10	90	yes	No	No	Appendectomy	No	No	2	8
11	70	yes	No	No	Drainage only	No	No	3+2 (5)	15
12	110	yes	No	No	Appendectomy	No	No	2	4
13	70	yes	No	No	Appendectomy	No	No	1	7
14	100	yes	No	No	Drainage only	No	No	2+1 (3)	13
15	90	yes	No	No	Appendectomy	No	No	3	9
16	80	yes	No	No	Appendectomy	No	No	2	6
17	110	yes	No	No	Appendectomy	No	No	2	7
18	80	yes	No	No	Appendectomy	No	No	3	8
19	90	yes	No	No	Drainage only	No	No	3+2 (5)	12
	90m (1.5hr)	all cases need consultant	No	No	One setting in 14 (73%) & 5 (27%)	1 (5%) other diagnosis	2 (10%) complications	2.5d	~9 day

**Table 5:** Comparative study between four groups.

Modalities of Treatment	Efficacy	Other Diagnosis	Difficulties encountered during operative cases					Hospital Stay (Total)	Total duration of Treatment
			Time in Minutes	Consultant is needed in	Appendectomy	Complication	Post-operative Complication		
Group A	Successful in 37 (88%). Failed in 5 (12%)	1 (~2%)	65m (1hr)	3 (7%)	-done in all cases -2(4.7%) in two stages	No	4 (9.5%)	6	18
Group B	*successful in 69 (87%) *Failed in 13% *Recurrence in 4 cases (6%) *Eventual appendectomy in 14 cases (18%) and 82% of cases saved appendectomy *Recurrence in 6% 4 cases	1 (1.3%)	110	4 (33%)	-done in 12 patients (15%) -4% of patients in 2 setting	No	One (8%)	5	13
Group C	*successful in one setting in 25 (86%) *14	2 (7%)	112 (2hr)	19 (66%)	-done in 100% -1 setting in 25 (86%) -2 setting in 14%	1 (~3%)	7 (24%)	3.5	10
Group D		1 (5%)	90	100%	-1 setting in 14 (73%) -2 setting in 5 (27%)	No	2 (10%)	2.5	9

Group B included seventy nine cases shown in Table 2. Conservative management was successful in 69 (87%) and failed in ten cases (13%). One case (1.3%) was cecal mass (adenocarcinoma) that mis-diagnosed as appendicular mass. It was discovered during

operative interference after failure of conservative measures where right hemi-colectomy was done. Recurrence of the attacks occurred in four cases (6%) where appendectomy was done. Surgical interference was done in fourteen cases (~18%); four cases for recurrent attacks &



**Figure 1:** Clinically palpable appendicular mass in male.



**Figure 2:** Clinically palpable appendicular mass in female.



**Figure 3:** CT demonstrating appendicular mass.

ten for failure of conservative treatment. In this group appendectomy was done in one setting in twelve cases & three cases (~4%) were done in two settings (drainage then appendectomy). The average total hospital stay was about 5 days and the average duration of medical treatment was about thirteen days. The details of operative cases entailed; average operative time of approximately two hours, with the consultant was requested in about one third of the cases. One case (8%) of SSI developed and controlled medically.

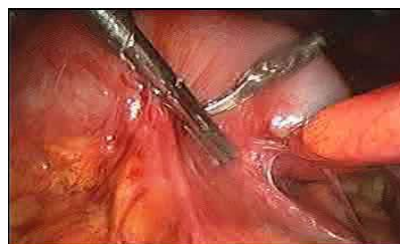
Group C involved twenty nine cases shown in Table 3. Appendectomy was done in one setting in 25 cases (86%) and in two settings in four cases (14%). The mean time of the operation was about two hours, with a need of consultant in nineteen cases (66%). Intraoperative bleeding (mild) occurred in one case (3%) and controlled. Two cases (~7%) were found to have another diagnosis during explorations (ileocecal lymphoma & Chron's disease of the appendix Figure 3). Seven cases developed complications (24%); one seroma, five SSI treated medically, and one incisional hernia which repaired one year later on. The total hospital stay was approximately



**Figure 4:** Chron's disease presented as appendicular mass.



**Figure 5:** Laparoscopic adhesiolysis of appendicular mass.



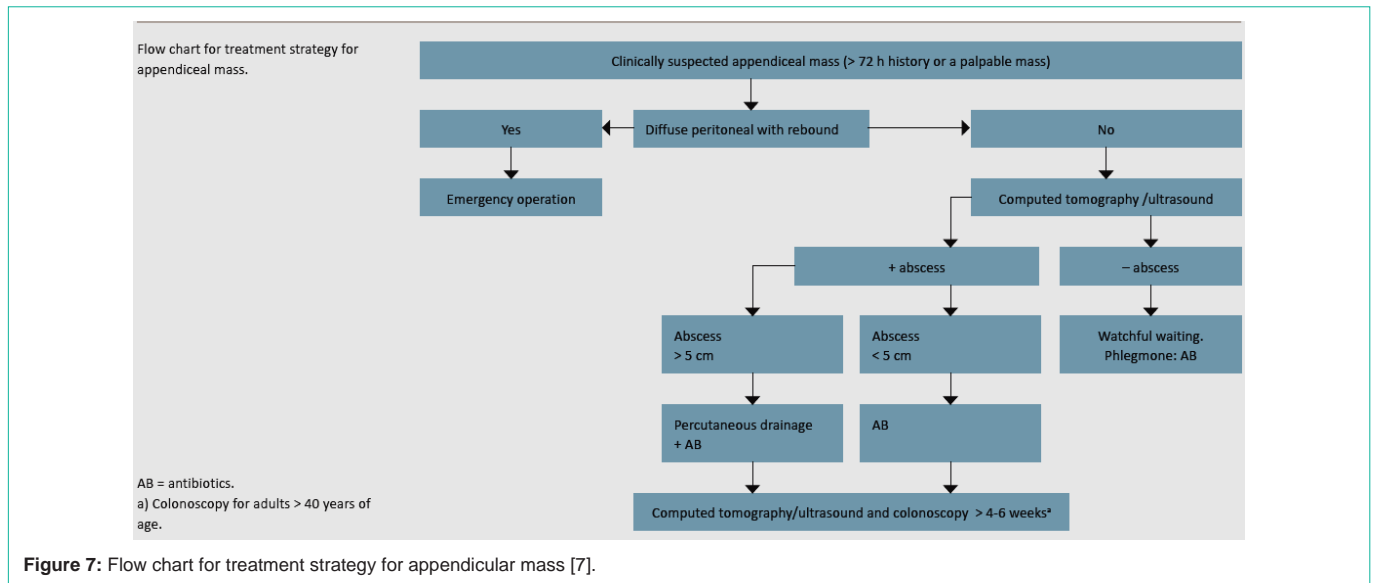
**Figure 6:** Right salpingo-oopheritis with amalgamated omentum and bowel mimic appendicular mass.

3.5 days while the average total duration of treatment was ten days.

Group D included nineteen cases shown in Table 4, Figure 5a-5c. Appendectomy was done in one setting in 14 cases (73%) and in two settings in five cases (27%). The mean time of the operation was about 1.5 hours, with a need of consultant in all cases. No intraoperative complication or conversion to open surgery occurred

One case (~5%) was found to have another diagnosis during explorations (right salpingo-oopheritis with amalgamated omentum Figure 6). Two cases developed post-operative complications (10%) in the form of minor SSI that treated medically. The total hospital stay was approximately 2.5 days while the average total duration of treatment was less than nine days.

On comparing & reviewing the data in the four groups as shown in Table 5 we found that, the conservative management was applied in 121 patients (patients in group A&B) and it was successful in 106 patients (~88%) and failed in 15 patients (~12%). Other pathology rather than appendicular mass was found in five cases in all groups (~3% of all cases) that misdiagnosed as appendicular inflammatory mass. Appendectomy was done in all (100%) patients of group A, C & D, and only in 14 patients (18%) in group B, with 82% of the patients in this group saved appendectomy without any harm. Appendectomy was done in two settings (drainage then appendectomy) in ~5% of group A, ~4% of group B, 14% of group C, and 27% of patients in



group D. Hospital stay & duration of treatment were >2 folds more in conservative groups (A&B) than intervention groups (C&D). Difficulties in operations were reported more in intervention groups (C&D), where consultant was needed in all cases of group D, 2/3 of group B, and only 1/3 of group B & 7% in group A. The average operative was in insignificant in four groups ranging from 1.5 to 2 hours. This may be attributed to rapid decision in difficult cases to put a drain and complete the procedure in two stages. Complications were more in group C 24% but most of them were minor. There was no significant difference in operative difficulties between patient failed conservative measures and interventional group from the start (group C&D).

## Discussion

The lifetime probability for the development of appendicitis is 8.6% in males & 6.7% in females [3]. Approximately 7% of these patients will develop appendicular mass [6], especially with development of strong antibiotic [2]. This usually occurs after 48-72 hours of the first symptoms of acute appendicitis [7]. As a natural protective mechanism, the omentum & small bowel wrap around the inflamed appendix to isolate it from the rest of the abdominal cavity preventing spread of infection [8] & forming the components of the mass [9]. This usually becomes palpable in the right iliac fossa by the third day [10]. There are no universal standard or clear-cut guidelines in the management of the appendicular mass with extreme modalities of treatment [5]. Currently there are four modes of treatment practiced all over the world which include [11].

Initial conservative approach followed by routine interval appendectomy 6-8 weeks later [12]. This is the traditional & the most commonly practiced approach in the absence of abscess formation [7]. It is trusted & favored widely all over the world because of; its efficacy & safety [13], with avoidance of the potential hazards of intestinal injuries [14]. The success rate ranges from 88-95% [31], with substantially low rate of complications [14]. Surgeon preference remains a common reason [15]. Interval appendectomy is considered here to be essential, believing that the rate of recurrent appendicitis is

high [16]. Interval appendectomy is a safer & easier procedure than to do appendectomy in the initial admission [17].

Early appendectomy once diagnosed, using either open or laparoscopic technique [18]. Those advocate this approach consider the avoidance of; misdiagnosis (or hidden other pathology), more demanding operative interference when the conservative management failed, and repeated admissions of the recurrent attacks that ultimately required appendectomy after frequent admission [19]. Some studies provided this approach as a safer feasible one with no significant harm [20]. Laparoscopic approach provides minimal invasive modality with less hospital stay and rapid recovery [21], however it needs expert to manipulate the intestines and dissect the mass safely.

Semi conservative approach with immediate appendectomy after clinical improvement during the initial [22]. This team considered the advantages of early appendectomy mentioned before. They claimed that it is safer than immediate appendectomy. However, there no studies support difference in safety between immediate appendectomy and early appendectomy after initial treatment [22].

Entirely conservative treatment without routine interval appendectomy. Those advocate this approach consider the advantages of initial conservative management in terms of efficacy and safety [23]. It is argued that interval appendectomy is unnecessary [10] after successful conservative management of an appendicular mass because of low rate of recurrence [24]. They recommend the interval appendectomy only in patients exhibiting recurrent attacks [25]. In addition, the appendix may be fibrotic [26] & may not be found on operation which may make some of the routine interval appendectomy difficult [27]. This has led to the concept of a "wait and watch policy" after successful conservative management and has been found to be cost effective [28]. Those advocates of this approach may go as far as to propose that recurrent disease is also amenable to conservative treatment and is cost effective [8].

The greatest risk of developing recurrent appendicitis after successful conservative management is during the first 6 months and



there is a minimal chance for developing the symptoms after 2 years [29].

This study documented the efficacy of the four modalities of management either conservative or interventional. The conservative approach is quiet effective one with success rate of about 88%. Patients who failed conservative approach, had no significant difference with interventional groups (C&D) in terms of operative time, need of expert, occurrence of complications. Appendectomy was documented in this study to be unnecessary in 82% of patients of conservative approach without any harm to the patients. So 82% of the patients in this group saved un-necessary interference. The rate of recurrence in conservative approach was too low to be a burden, only 6% of the patients with less significant difference in operative difficulties compared to other groups (C&D).

The amalgamated bowels and omentum make the adhesiolysis and dissection of the mass difficult, which may end the surgical interference by drainage alone and postpone appendectomy in other stage to ensure safety of the patients. The risk to do appendectomy in two stages (drainage then appendectomy) was high in interventional group specially the laparoscopic one. However, the hospital stay and duration of treatment were markedly reduced in interventional groups specially the laparoscopic one. Although the complications of all groups were minor but still the open operative approach carried more risk than other groups to develop them (more than two folds).

In the literature many studies confirmed the un-necessity of routine elective appendectomy [6], reporting that most of the patients don't usually suffered from repeated attacks [10,29,30]. Jesper Olsen et al assessed the various treatment modalities with respect to complications and treatment failure through the analysis of a qualitative systematic review in literatures from 1966 to March 2014 and recommend conservative approach & watchful seeing policy for appendicular mass without evidence of abscess formation & recommend step down strategy according to the presentation of the patients as in Figure 7, [7].

Although the advantages of conservative approach, the presence of 3% of cases in this study with other diagnosis emphasis on the importance to do detailed investigations even after relieve of the attack to be sure that there is no hidden pathology in the conservative groups. CT, MRI, and colonoscopy may be beneficial here.

The laparoscopic approach seem to be growing and hoping approach with less complication and hospital stays and durations of treatment as well as discovery of other pathology and early drainage of possible abscess and may be with growing learning curve a change in the curve may be done.

## Conclusion

Although there is a debate in the best modalities of treatment of appendicular mass, the conservative approach is a quite effective & safe method of treatment, with no significant operative difficulties in failed group. The rate of recurrence after successful conservative management is low to justify interval appendectomy as a routine. Appendectomy should be restricted to the few cases exhibiting recurrent appendicitis. CT & or colonoscopy is preferred to be done after relief of acute attacks specially in risky patients to avoid missing

another pathology. The laparoscopic approach seem to be promising, with early recovery and less hospital stays and durations of treatment as well as diagnostic superiority for a hidden pathology which may become the superior modalities with growing learning curve .

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