



## Evaluation of diagnostic parameters of appendicular mass in acute appendicitis – A prospective observational study

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### INTRODUCTION

An appendicular mass is a common surgical clinical entity, encountered in 2- 6% of patients presenting with acute appendicitis[1]. Appendicular mass is the localization of infection occurring 3 to 5 days after an attack of acute appendicitis. The mass develops when appendicitis is caused by obstruction of the lumen and there is an ensuing danger of perforation of the appendix following ischemic necrosis and gangrene of the appendicular wall . As a natural protective mechanism, the omentum and small bowel wrap up the inflamed appendix in an attempt to prevent infection from spreading by isolating the inflamed organ from rest of the abdominal cavity.

The patient usually presents with a tender mass in the right iliac fossa associated with fever, malaise and anorexia. This walling off mechanism may fail and generalized peritonitis may ensue. This is more often seen when there is obstruction of the appendicular lumen by a faecolith, an immune compromised patient, the extremes of age, Diabetes mellitus and when the inflamed appendix is lying freely in the pelvis beyond the ability of the omentum to wrap the inflamed organ[1]

Raised white blood cell count with C-reactive protein, neutrophils percentage , CRP, elevated serum bilirubin are important markers in distinguishing complicated appendicular mass like perforation and abscess formation.[2,3]. Conservative management of appendicular mass has been facilitated by improved imaging techniques with the help of computerized tomography (CT) and ultrasonography [4].

Three modes of management of appendicular mass is practiced now; (i) conservative management with interval appendectomy in 6 to 8 weeks, (ii) immediate appendectomy before the resolution of that mass , (iii) An entirely conservative approach without interval appendectomy with regular follow up. Conservative management for appendicular mass initially as described by Ochsner in 1902 has so far been followed routinely by surgeons worldwide. Initial conservative technique has a lower rate of complications than an early

surgical intervention [5,6] . Immediate appendectomy may be technically demanding because of the distorted anatomy and the difficulties to close the appendiceal stump because of the inflamed tissues [7]. Cautious decision making is necessary when adopting entirely conservative approach due to misdiagnosis of appendiceal tumor or colonic tumor. [8]

Therefore the present study was undertaken with the aim of evaluation of diagnostic parameters of appendicular mass and outcome of conservative approach followed by interval appendectomy after complete resolution of the inflammatory mass and emergency appendectomy following failed conservative approach.

## AIMS AND OBJECTIVES

**AIM:** To study and evaluate the diagnostic parameters in appendicular mass in acute appendicitis

**OBJECTIVES:** To study the clinical presentation of appendicular mass. To study the different modalities of treatment and their outcome of appendicular mass. To study the complications, morbidity and mortality in emergency appendicectomy and conservatively treated appendicular mass.

## METHODS

This study has been done on 90 patients with appendicular mass who presented to SURGERY OPD/casualty, at Jorhat Medical College and hospital, Jorhat Assam, at the period between 1<sup>st</sup> June 2021 to 31 May 2022. Our study is a clinical, cross-sectional observational study

**Inclusion Criteria:** Affected individuals admitted to the Department of General Surgery, Jorhat Medical College with appendicular mass.

**Exclusion Criteria:** Patients with malignant pathology. Patients with ileocecal TB. Previous history of abdominal operations. Pediatric age group. Pre existing bowel pathology, IBD. Patients opting out of the study.

Detailed history and thorough clinical examination were done in all the selected cases as per the predesigned proforma. Complete blood count; urinalysis; urea and electrolytes; plain x-ray abdomen; and ultrasonography of abdomen and other investigations as per need of the patient were done.

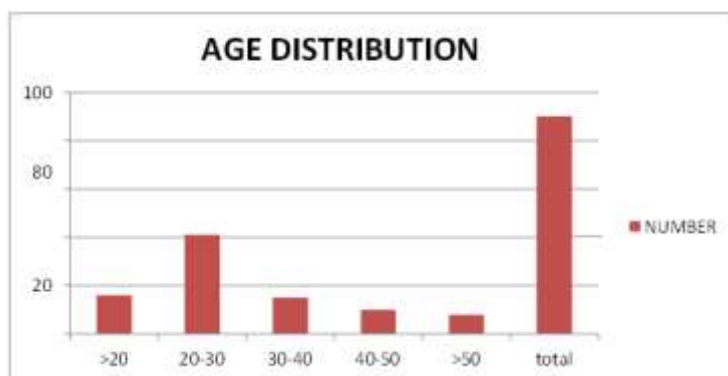
After taking detailed history and clinical examination, relevant blood and radiological investigations were done to achieve the final diagnosis. Studies were done on the patient's history, examination results, investigations, kind of surgery, co relation of inflammatory markers like CRP, WBC counts, serum bilirubin were assessed separately in patients undergoing emergency appendectomy and interval appendectomy, length of surgery, postoperative problems and length of hospital stay. Data was gathered, compiled, tabulated and analysed.

In this research, we analyzed a series of appendicular mass in the following categories.

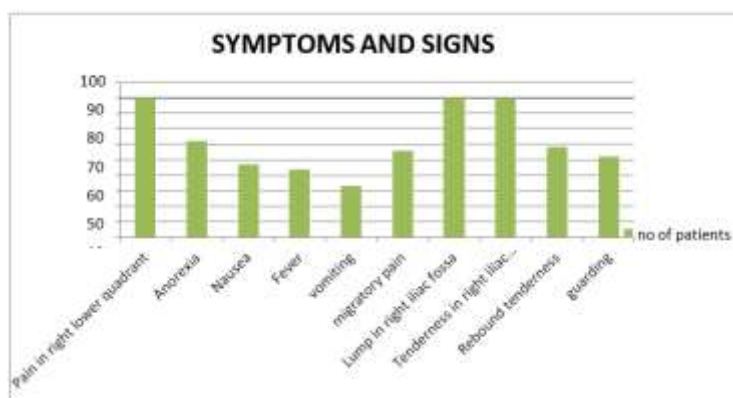
Groups	Categories
Group A	Surgical intervention done at the time of presentation
Group B	Successful conservative management followed with interval appendicectomy
Group C	Appendicectomy performed as an emergency procedure after ineffective conservative treatment

## RESULTS

Majority of the patients were from the age group 20- 30 years which consisted of combine 45.56% of cases. Incidence was more in male, male to female ratio

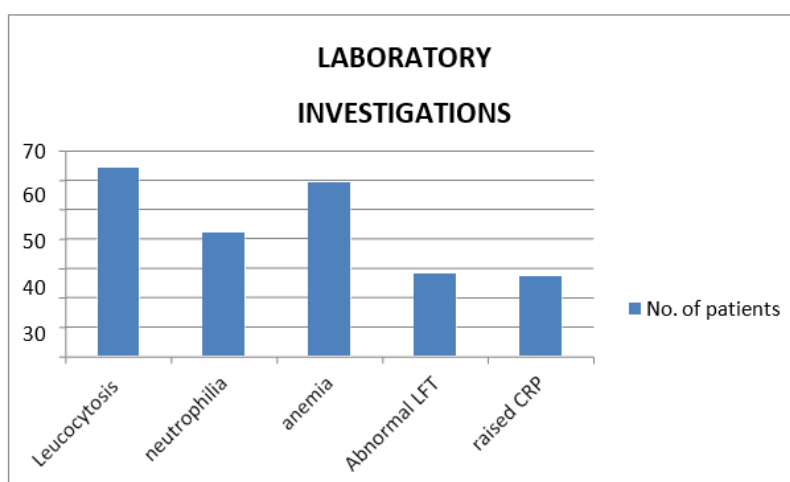


**Figure 1:** Age distribution of patients studied



**Figure 2:** Showing presenting complaints /symptoms & sign

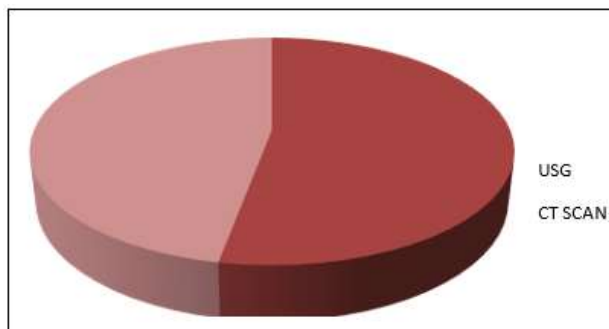
Right lower quadrant pain was the most common symptom in all patients (100%), followed by anorexia (88%), nausea(52%) fever (48%)& vomiting (36%).With regard to signs, lump and tenderness in right iliac fossa were found in all patients (100%), followed by rebound tenderness (64%) and generalized guarding & rigidity (57.78)



**Figure 3:** Bar chart of laboratory investigations

Leucocytosis (WBC count >11,000 cells/cu.mm) was noticed predominantly in 64 patients

(71%) and neutrophilia 42 patients(46.67%)was observed. Anaemia was noted in 59 (65%), elevated liver enzymes in 28 (31%), raised CRP in 27(30%)Figure 3.



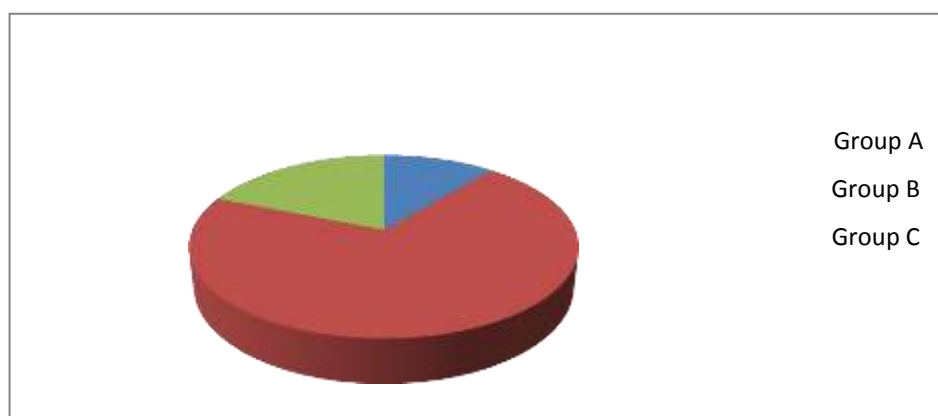
**Figure 4:** Pie chart of radiological investigations

All patients (100%) were confirmed as appendicular mass and its complications by USG, CT scan confirmed the diagnosis in 80(88.88%), in 10 patients CT scan could not be done as the patients were operated on the day of admission.

A total of 90 patients were treated during study period, 10 patients were operated at the time of presentation, 63 patients were successfully managed conservatively and underwent interval appendectomy, 17 patients had failed conservative management followed by emergency appendectomy.

**Table 1:** Management

GROUP	TREATMENT MODALITIES	NO.
Group A	Surgical intervention done at the time of presentation	10
Group B	Successful conservative management followed with interval appendicectomy	63
Group C	Appendicectomy performed as an emergency procedure after ineffective conservative treatment	17
TOTAL		90

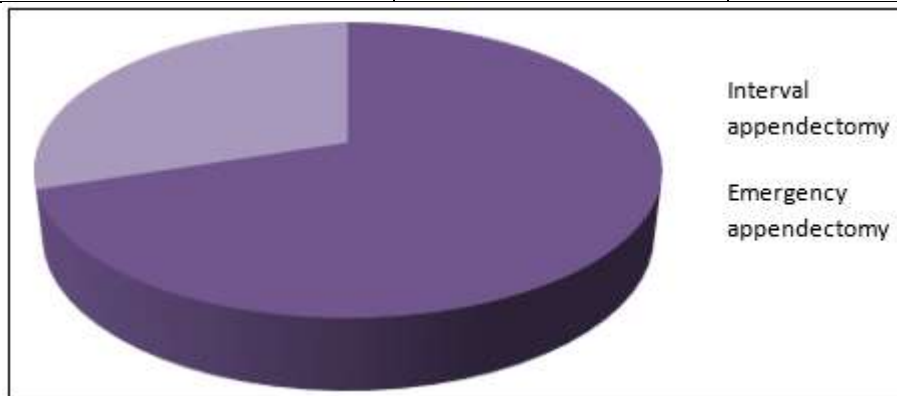


**Figure 5:** Pie chart of treatment modality

Treatment modalities were split into three groups. as in table 1. The majority of patients (70%) underwent conservative management (ochsner sherren regime) i.e. medical, whereas 27 patients (30%) were managed surgically as in group A and C 10 and 17 respectively.

**Table 2:** Types of surgical procedure

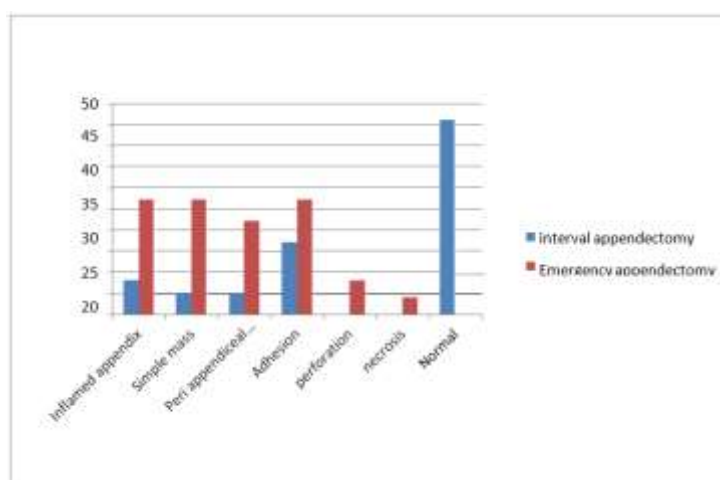
Surgical procedure	Number of patients	percentage
Interval appendectomy	63	70%
Emergency appendectomy	27	30%
<b>Total</b>	<b>90</b>	<b>100</b>



**Figure 6:** Pie chart of surgical procedure

**Table 3:** Intraoperative findings

OPERATIVE FINDINGS	Conservative (interval appendectomy)	PERCENTAGE	Emergency appendectomy	PERCENTAGE
	N=63		N=27	
Inflamed appendix	8	12.6%	27	100%
Simple mass	5	7.9%	27	100%
Peri appendiceal collection/PUS	5	7.9%	22	81%
Adhesion	17	26.9%	27	100%
perforation	0	0	13	48.14%
necrosis	0	0	4	14.8%
Normal	46	73%	0	0

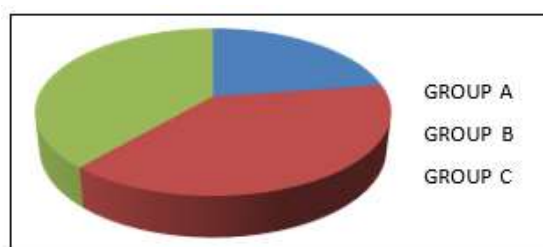


**Figure 7:** Intra-operative findings

During emergency appendectomy, inflamed appendix with lump and adhesion were noticed in 100% patients, followed by peri-appendiceal collection predominantly found in 81% patients. Fecolith and perforation of appendix found in 48.14% of each patient and necrosis in 4 (14%) patient. In interval appendectomy patients, most of the conditions of appendix were unremarkable. 26.9% patients had adhesion, 12.6% inflamed appendix and only 7% patients had lump & peri-appendiceal collection.

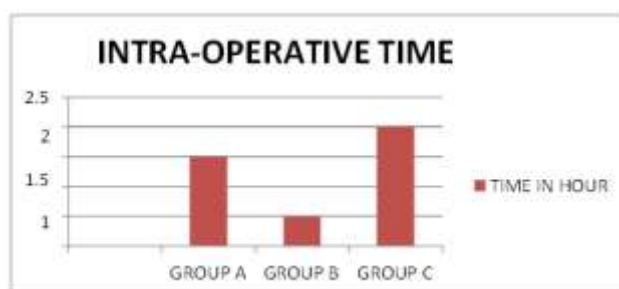
**Table 4:** Complication of appendectomy for appendicular mass

COMPLICATIONS	GROUP A	GROUP B (conservative /interval appendectomy)	GROUP C
Intraoperative adhesions	10(100%)	17(26.95%)	17(100%)
Surgical site infection	4(40%)	4(6.3%)	8(47%)
Caeco-cutaneous fistula	0	0	0



**Figure 8:** Pie chart of complications

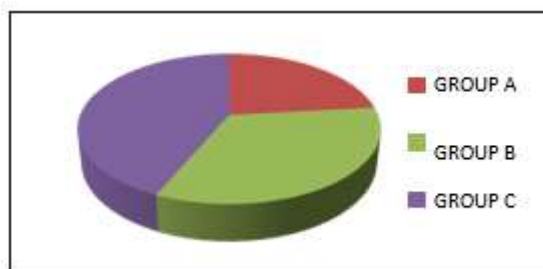
Intraoperative adhesions were found to be more in Group A and C. Surgical site infection was the commonest complication encountered. Complications in group C was found to be proportionally higher in almost all aspects followed by A.



**Figure 9:** Intra-operative time

**Table 5:** Hospital days

GROUP	HOSPITAL DAYS
GROUP A	5-7 DAYS
GROUP B	5-10 DAYS
GROUP C	9-13 DAYS



**Graph 10: Hospital days**

When comparing the operative time among the different modalities of management, group A had average time of 1.5-2 hours. Group B had over 0.5-1 hour and group C had the longest time of over 2 hours. The postoperative time was 5-7 and 5-10 days in groups A and B respectively. Group C had a longer duration of more than 10 days.

**Table 6: Inflammatory markers**

<b>Inflammatory marker</b>	<b>EMERGENCY APPENDECTOMY(n=27)</b>	<b>INTERVAL APPENDECTOMY(n=63)</b>
positive CRP	24 (88.88%)	9 (14.28%)
negative CRP	3 (11.11%)	54 (85.71%)

Table- 6 shows the CRP values between patients undergoing interval appendectomy and emergency appendectomy. 24 patients (88.88%) of the total patients underwent emergency appendectomy(n=27) were found to have elevated CRP levels, while 3 patients (11.11%) had normal CRP levels. Similarly, 9 patients (14.28%) of the total patients who underwent interval appendectomy(n=63) had positive CRP levels, while 54(85.71%) patients had negative CRP levels.

**Table 7: WBC counts**

<b>WBC COUNTS</b>	<b>EMERGENCY APPENDECTOMY(n=27)</b>	<b>INTERVAL APPENDECTOMY(n=63)</b>
WBC >11,000	22(74.04%)	20 (31.7%)
WBC<11,000	5 (25.92%)	43(68.25%)

TABLE 7 shows values of The WBCs between patients undergoing interval appendectomy and emergency appendectomy. 20 patients (74.04%) of the total patients underwent emergency appendectomy(n=27) were found to have WBC>11,000, while 7 patients (25.92%) had WBC levels (<11,000). Similarly, 20 patients (3.7%) of the total patients who underwent interval appendectomy(n=63) were found to have WBC >11,000, while 43 patients (68.25%) had WBC <11,000.

**Table 8: Serum bilirubin**

<b>SERUM BILIRUBIN</b>	<b>Emergency appendectomy(n=27)</b>	<b>Interval appendectomy(n=63)</b>
RAISED	24(88.88%)	7 (11.11%)
NORMAL	3(11.11%)	56 (88.88%)

Table 8 shows raised serum bilirubin levels in patients who underwent emergency appendectomy & interval appendectomy. 24 patients (88.88%) of the total patients underwent emergency appendectomy(n=27) were found to have elevated bilirubin levels (> 1.0 mg/dL) while 3 patients (11.11%) had normal bilirubin levels ( $\leq$  1.0 mg/dL). Similarly, 7 patients (11.11%) of the total patients who underwent interval appendectomy(n=63) were found to have elevated bilirubin levels (> 1.0 mg/dL) while 56 patients (88.88%) had normal bilirubin levels ( $\leq$  1.0 mg/dL).

## DISCUSSION

An appendicular mass is common surgical clinical entity encountered in 2- 6% of patients with acute appendicitis.[1] Appendicular mass is the localization of infection occurring 3 to 5 days after an attack of acute appendicitis.

Appendicular mass is essentially a clinical diagnosis, palpation of a tender mass in right iliac fossa, which is smooth, firm, well localised, not moving with respiration, not mobile, all borders well made out (well localised) & resonant on percussion is diagnostic. Patient may have fever & features of toxicity.

Investigations like raised WBC counts, CRP, serum bilirubin are used as adjuncts for diagnosis of severity of appendicular mass. Ultrasonography is a unique mode of investigation as there is no radiation exposure, easily available, cost effective, multiplanar imaging capability when performed by skilled hand. Abdominal Ultrasonography is often the first morphologic study performed on patients with acute abdomen. CT provides the diagnosis of appendicular mass by differentiating it from simple perforation or peri-appendiceal abscess or malignant mass in elderly.

Immediate appendectomy is the accepted therapy for early acute appendicitis, but the management of patients with more advanced stages of this disease, who present with an abdominal mass, remains controversial. The palpable mass may contain phlegmon, composed of adherent omentum and small bowel loops, or abscesses of various sizes. Interval appendectomy is usually performed 6 to 8 weeks later to prevent the recurrence.

Emergency surgery has a certain place in the treatment of appendiceal mass and abscess. High frequency of postoperative complications is the negative side of this method. These complications are caused by oedema and the vulnerability of the adjacent small and large intestine, and difficult approach to the appendix due to deformation of anatomic structures and location. Conducting colonic resections (ileocectomy, right hemicolectomy) is sometimes necessary instead of appendectomy due to the acute inflammation and adhesion.

In the present study ninety cases of appendicular mass who attended JMCH, Jorhat emergency from June 2021 to May 2022 were included.

### ***Age and sex incidence***

Present cross sectional observational study consists of 90 patients having age ranged from 20 years to 60 years with maximum incidence in 20-30 years which consisted of combine of 45.56% with mean age  $30 \pm 11.3$  and male to female ratio as 2:1. Ali S et al [9] reported the age range in their series to be from 12 to 65 years with maximum incidence in 2<sup>nd</sup> and 3<sup>rd</sup> decade with male-female sex ratio as 2:1. Emmanuel BO et al [10] reported the age range in their series to be from 3 to 79 years with mean age of  $37.2 \pm 3.6$  years with male-female sex ratio as 2.4:1.1. Vakili C et al

[11] in his study found that the age of the patient ranged from 14 to 60 years with male to female ratio as 2.3:1.3. Findings in this study are comparable to the above studies with almost similar observation regarding the age incidence with male to female ratio of the incidence of appendiceal mass.

### ***Clinical signs and symptoms***

Pain in the right lower quadrant in this series was found in all 90 cases (100%), almost similar finding were reported (100%) by Samuel M et al [12]. Anorexia is seen in 88% in this study. Almost similar finding were also claimed by Samuel M et al [12] (87%). Fever is present in 48% in this study. Almost similar finding was reported 53% by Erik SK et al [13]. Irfan K et al [14] reported palpable appendiceal mass in 100% of cases. This study also gives similar finding of palpable lump in 100% cases.

### ***Investigations***

The present study highlighted leucocytosis ( $>11,000/\text{cu.mm}$ ) in 71 %. Jordan JS et al [15] in



their study observed leucocytosis 66% which is comparable to our study. Ultrasonography accuracy rate in diagnosis of appendiceal mass was 100% in this study which was almost similar to the report established by Samuel M et al [12] as 98%. Anaemia was found in 21%, elevated liver enzymes in 31%. X-ray chest PA view, ECG and Random blood sugar were found to be normal. Raised CRP, WBC & serum bilirubin was found in patients who underwent emergency appendectomy and were statically significant ( $p$  value  $< 0.001$ ). These parameters can be used as an adjunct to the diagnosis of severity of the disease.[23] H.C.Kim et al. (2011) in their study on evaluation of relationships between blood inflammatory markers and CT findings concluded that total white cell count better detects early appendiceal inflammation and an elevated CRP level better detects perforated appendix [24].

### **Operative findings**

In this study open appendectomy was performed in all 90 cases which comprises 27 emergency and 63 interval appendectomy. Samuel M et al [12] in their study reported that 100% of patients had an identifiable appendix at operation and had adhesion and peri-appendiceal collection operated on first day of admission. In this study, 100% of adhesion and appendiceal lump and 81% of peri-appendiceal collection were noted in emergency appendectomy group whereas interval appendectomy had 12.6% of adhesion, 7.9% appendicular lump and 7.9% peri-appendiceal collection. Khan AW et al [16] in their series reported that 100% of cases had an appendiceal lump and 86% had loculated collection. Present findings are almost similar with the findings of the above mentioned author. In this study, out of 27 patients in emergency group, perforation of appendix in 8(29.6%) patient and necrosis in 4(14.8%) patients.

### **Post operative complications.**

Kumar S et al [17] reported no wound infection in interval appendectomy group. Emmanuel BO et al [10] reported that wound infection in early appendectomy group to be 27.3%. Samuel M et al [12] in their study reported the incidence of post operative complication in early and interval appendectomy to be 12.1% and 0% respectively. De U et al [18] reported that 1.1% of patients developed band obstruction in immediate appendectomy group. This study showed early appendectomy group had wound infection rate of 40% whereas it was 14% in interval appendectomy group. Adhesion and Obstruction was found in 10% with emergency groups where as it was 26% in interval appendectomy group.

### **Hospital stay**

Brown CV et al [19] reported a mean hospital stay of  $10.7 \pm 5.4$  days. Surana R et al [20] reported a mean hospital stay of 9.7 days. Foran B et al [21] reported a mean hospital stay of 7.2 days. Erdogan D et al [22] reported a mean hospital stay of  $8.9 \pm 2.6$  days. Present study comprised of mean hospital stay of  $9.36 \pm 4.1$ .

## **CONCLUSION**

This study had concluded that incidence of appendicular mass following acute appendicitis are increasing in frequency in this part of the country, mean age group was  $30 \pm 11.93$ , with male patients predominance. The patient mostly presents with the right lower quadrant pain followed by anorexia, nausea, fever and vomiting. The diagnosis was based on clinical and abdominal ultrasound. Leucocytosis, raised CRP, and serum bilirubin were analysed separately in patients undergoing emergency appendectomy and interval appendectomy, it was raised in patients undergoing emergency appendectomy in our study whose operative findings was mostly appendicular perforation and necrosis. It was statistically significant. Hence these parameters can be used as an adjunct to make decision of emergency appendectomy along with clinical & radiological findings. Ultrasound is the investigation of choice in patient with appendicular mass.

There was significance difference in operative findings and complications with more complications occurring in group of patients who underwent emergency appendectomy hence these patients had more morbidity rather than patients who underwent conservative management followed by interval appendectomy.

Based on results of our study state that appendicitis associated with a mass could be treated safely and effectively by initially using conservative managements followed by interval appendectomy. Emergency surgery can be processed only in those patients were it is inevitable.

The clinical examination is still the most crucial technique for identifying an appendicular mass. When there is a doubtful palpable mass, radiological studies are required. Patients were managed using the Ochsner-Sherren regime, and surgery was performed. After examining several interventional techniques, we have come to the conclusion that conservative care followed by interval appendectomy is the most successful and safest course of treatment, with less operational difficulty and superior results.

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