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Acute Appendicitis: Clinical Decision and Histopathological Correlation

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ABSTRACT

Introduction: Acute appendicitis is one of the common causes of acute abdomen which is mainly diagnosed on clinical assessment and simple laboratory investigations. The objective of this study was to determine the diagnostic accuracy of clinical judgment and its histopathological correlation.

Material and Method: A retrospective review of patient with a preoperative diagnosis of acute appendicitis was done at the department of surgery (unit B) at the teaching hospital Kuliyapitiya. It reviewed patients admitted from 1st of January 2020 to 30th of November 2020.Thus 108 patients with clinical diagnosis of acute appendicitis who underwent operative procedures were included. The histopathological reports were reviewed and correlated with clinical diagnosis. The operative observation of gross appearance of appendix were compared with histological reports.

Results: Out of 108 patients who underwent surgery, 79 (73.15%) patients were found to have some stage of appendicitis histologically. The most common intra-operative positive finding was acutely inflamed appendix which accounted for 56.48%. It was followed by suppurated appendix and complicated appendix accounting for 17.5 % and 12.0 % respectively. The age distribution of the patient series was between 7 years and 72 years with mean age 31.5 years. Sex distribution among male and female were 47.22% and 52.78% respectively showing female predominance. High white cell count seen in 79.50% patients with increased neutrophils in 65.74% patients. CRP was elevated among 70.50% patients. On gross appearance of the appendix intraoperatively 13.88 % had normal

looking appendix and rest of the appendix showed various stages of inflammation ranging from simple appendicitis to complicated appendix.

Conclusion: Surgeon's clinical skill and basic investigations are good enough in diagnosis of acute appendicitis when auxiliary diagnostic modalities are not available to enhance the diagnostic accuracy. Intra operative gross appearance along with the experience of the surgeon is enough to establish an accurate diagnosis. The final diagnosis must be made with the histology.

Key Words: Appendicitis, Clinical diagnosis, Appendectomy, Histopathology.

INTRODUCTION

Acute appendicitis is one of the most common surgical emergencies in both developed and developing countries with a lifetime prevalence of approximately 1 in 7 [1]. It is common between age 7 and 15 years [2]. But none of the age groups is immune.

The diagnosis of acute appendicitis is mainly based on clinical assessment aided with laboratory investigation; including white cell count (WBC) and C reactive protein (CRP). Among the radiological investigation ultrasound scan is the most widely used modality in diagnosis in acute appendicitis. But the diagnose value is much less with ultrasound scan as it is highly operator dependent [3]. Although the contrast enhancing computer topography (CECT) has become a preferred imaging technique in the diagnosis of acute appendicitis and its complications, it is not frequently available in our setup.

As symptoms of acute appendicitis overlap with a number of other conditions, sometimes the clinical diagnosis is difficult. In addition, various other factors such as late presentations, partially treated patients make the clinical diagnosis more challenging. The laboratory predictions are also not constant and accurate, especially WBC and CRP which are not specific for appendicitis [4]. However, a combination of both clinical assessment and lab findings seem to increase the specificity. But the diagnosis become difficult when the investigations are normal

Due to the above factors a number of authors have advised the use of clinical scores to assess and decide on acute appendicitis [5].

The goal of our study was to find out the discrepancy of clinical decision and histological findings of appendicitis and to find out the discrepancy of surgical observation (gross appearance) and histopathological diagnosis.

MATERIALS AND METHODS

We retrospectively reviewed medical records of all patients operated with a preoperative diagnosis of acute appendicitis over the period between 01/01/2020 and 30/11/2020 admitted to surgical unit B at teaching hospital Kuliyapitiya. There the clinical diagnosis of acute appendicitis was established preoperatively by means of history, physical examination and traditional laboratory investigation including white cell count and CRP. Some patients had undergone ultrasound scans either to rule out or strengthen the clinical diagnosis. Each and every patient's operative decision has been made by the consultant surgeon of the unit.

The data collected from medical records included age, sex, symptoms and signs, WBC and CRP and operative findings. According to the intraoperative appearance of the appendix, patients were categorized into 4 groups. As an example, visible hyperemia was considered as an indicator of inflamed appendix.

1. Normal looking appendix.
2. Inflamed appendix.
3. Suppurated appendix.
4. Complicated appendix. (Which included gangrene, ruptured and abscess formation)

Appendicectomy done while performing laparotomy for other pathologies were excluded. Patients who presented with appendicular mass were also not included in the study.

Histological reports were collected from the histopathology laboratory. The data of a total of 108 patients were analyzed using Microsoft Office Excel 2019 Package. Histology reports were used to confirm the diagnosis of acute appendicitis. Reports which reported reactive lymphoid hyperplasia or carcinoid tumor as the histological diagnosis were considered as Histologically Negative. The rest of the reports were considered as histologically positive ones.

RESULT

A total of 108 patients who were preoperatively diagnosed to have acute appendicitis were studied; out of which 51 (47.2%) were male and 57 (52.7%) were female. The age distribution was 7 years to 72 years with the mean age of 31.5 years. As **(Table 1)** presents 82 (79.5%) had elevated total WBC whereas only 71 (65.7%) had high neutrophil count. WBC above 10 000 per microliter and the neutrophil percentage more than 70% were considered as high. CRP level more than 5 was considered as positive and it was observed 78 (70.5%) had positive CRP levels.

Inflammatory marker	Number	Percentage
WBC > 10	82	79.5%
WBC < 10	26	20.5%
Neutrophil Count >70%	71	65.7%
Neutrophil Count <70%	37	34.2%
CRP < 5	30	29.5%
CRP > 5	78	70.5%

Table 1. Distribution of inflammatory markers

As in **(Table 2)** on gross appearance of the appendix intraoperatively 15 (13.8 %) had normal looking appendix and rest of the appendix which was 93 (86.1 %) in number showed various stages of inflammation ranging from simple inflammation to complicated appendix. Out of the positive patients, 61 (56.4%) of simple inflamed appendix was

observed. Grossly inflamed appendix and gangrenous appendix were 19 (17.5%) and 7 (6.4%) in number respectively.

Table 2. Intra- operative observation of gross appearance

Intraoperative Observation	Number	Percentage
Inflamed	61	56.48%
Grossly Inflamed	19	17.59%
Gangrenous	7	6.48%
Ruptured	6	5.57%
non inflamed	15	13.88%
Total	108	100.00%

29 (26.85%) patients with preoperative diagnosis of acute appendicitis had no histological evidence of acute appendicitis and they had reactive lymphoid follicular hyperplasia or carcinoid tumor which were 26 (24.1%) and 3 (2.7%) in number respectively as presented in **(Table 3)**.

Table 3. Histological distribution

Histopathologic Diagnosis	Number	Percentage
Acute appendicitis	59	54.62%
Reactive Lymphoid follicular Hyperplasia	26	24.10%
Acute suppurative with serositis	20	18.51%
Carcinoid tumors	3	2.77%
Total	108	100.00%

They were considered as histologically negative group as presented in **(Table 4)**. Samples of 59 (54.6%) patients were diagnosed to have acute appendicitis. Suppurated appendixes were noted in 20 (18.5%) histology reports.

All the histological reports of appendixes which were diagnosed as non-inflamed intraoperatively came as histologically negative.

Table 4. Histological outcome

Histological outcome	Number	Percentage
Histologically positive	79	73.14%
Histologically negative	29	17. 60%

Among the histologically negative patients, 19 (65.52%) were female and 10 (34.48%) were male as shown in **(Table 5)**. Out of the three carcinoid patients two were male and one was female; all were above 40 years with Mean age 44.33 years. These three patients have had ultra sound scan preoperatively but it was not suggestive of presence of carcinoid tumor.

Table 5. Sex distribution of histologically negative group

Female	19 (one carcinoid included)
Male	10 (two carcinoid included)

It was interesting to see that negative histology was quite common among the young age groups as displayed in **(Table 6)**.

Table 6. Sex and age distribution in histological negative group

Age group (Years)	**1-10**	**11-20**	**21-30**	**31-40**	**Above 40**
Female	01	08	06	00	04
Male	02	02	02	01	03
	03	10	08	01	07

Table 6. Sex and age distribution in histological positive group

	0-10	**11-20**	**21-30**	**31-40**	**Above 40**
Female	02	19	11	03	10
Male	02	11	05	04	12

	04	30	16	07	22

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DISCUSSION

The diagnosis of acute appendicitis remains mostly on the clinical features. There are many retrospective and prospective studies done abroad that have shown good correlation of clinical diagnosis of acute appendicitis with histopathological diagnosis. It has been reported in the literature that the negative rate of acute appendicitis varies from 20% to 30% with clinical diagnosis and many surgeons would consider the rate of less than 30% as acceptable [6]. The accuracy of clinical diagnosis is higher` among the young adult males but considerably poorer at the extremes of age, females of reproductive age, obese patients and late presentation etc. Due to atypical presentations and other overlapping conditions, negativity may be increased [7].

Joshi et al has published a prospective study in regards to appendicitis and its histopathological diagnosis. They concluded that the histological negative rate of acute appendicitis after clinical diagnosis was 14%. There the most of the subjects studied were within 15 to 25 years (59%). Hence, they got a lesser negative figure when compared to other studies (15%-30%). They assumed that their figure could be different if subjects of extremes of age were included. They observed correlation between intraoperative observation and histological diagnosis of appendicitis too. There they found that the intraoperative gross positive diagnosis was 91% sensitive and 97.7% specific. This avoids the unnecessary exploration of the abdomen [8].

However, the clinical decision of acute appendicitis taken by the surgeon is very important as the surgical interventions carry a risk of increased morbidity and mortality. Hence the use of a scoring system to enhance the accuracy in the diagnosis of acute appendicitis such as Alvarado Score is popular [9]. Studies have shown that on exploration 2%-7% of all adults had diseases other than acute appendicitis [10].

In this study the age of the patients ranges from 7 to 72 years which is similar to the other studies. The age predominance of our study was between 11 and 30 years which is again consistent with the other studies done. i.e., 10-30years [11]. The sex predominance is reported to be slightly higher for male [12]. Whereas our study shows that acute appendicitis was seen more among females than males. This finding was somewhat different when compared to other studies.

We have operated 108 patients and out of that 79 were histologically positive which shows clinical diagnosis of acute appendicitis is much accurate in our institute. Our negative rate of 26.85% is generally in the same range of other literature [13,14.15,16]. In a study done by Nabipour et al, a normal appendix was seen in 34.2% studied cases [13]. In another study done by Khan et al, a normal appendix was seen in 11.5% cases. [14] .Ojo et al showed 11.7% of preoperatively diagnosed patients had normal appendix [15]. 17.8% and 20% patients with normal appendix were seen in a study done by Hobler et al and Morrison et al respectively [16,17].

In our study both the increased WBC as well as the high neutrophil count were significant and were helpful for the clinical diagnosis.

Histological diagnosis of appendicitis in our series consisted of early acute appendicitis 59 (54.6%) and suppurative appendix 20 (18.5%). Interestingly 26 (24.1%) of histology reports revealed to have lymphoid hyperplasia. Lymphoid hyperplasia has been seen in very low percentage (0.2%) in the study done by Khan et al [14]whereas in contrast, 16.1% lymphoid hyperplasia has been seen in a study done by Malloy et al [18]. Studies have shown that lymphoid hyperplasia is usually the causative factor of acute appendicitis [19]. As here our population has shown higher lymphoid proliferation, studies have to be done further to find out possible reasons for it. Interestingly, the remaining 3 (2.7%) revealed carcinoid tumors which were not highlighted in most of the other studies. Therefore, it is important to think of possible carcinoid tumors with advancing age as all the carcinoid tumors were detected in patients above age of 40 years.

It is quite obvious that the negative histology was more common among the young females in this study. That age group was between 11 years to 30 years. So, the most reasonable explanation for this interesting finding would be that abdominal pain due to gynecological causes like Pelvic Inflammatory Disease is commonly diagnosed as acute appendicitis based on clinical findings. So, it is important to think about gynecological causes when a young female is presented with abdominal pain even though it carries a clear picture of acute appendicitis.

To reduce negative exploration of abdomen it's important to diagnose acute appendicitis clinically as well as intraoperatively. The operator will be satisfied when he finds the inflamed appendix, if not he would look for another intra-abdominal pathology which carries increased morbidity and mortality. To address that fact, we studied the association of intraoperative findings with histopathological reports. We found that 79 (73.15%) were histologically positive whereas the operator has noted that 93 (86.1%) as simply inflamed or as an advanced/complicated stage of appendicitis. This over diagnosis of appendicitis on appearance could be due to mildly dilated capillary on the appendix. Hence the accuracy of intraoperative judgment was 84.94% which is nearly keeping up with other studies. Some studies have shown that the pathology report of normal appendix is debatable. They have been reported that nearly 25% of histological normal appendix shows presence of TNF and IL2 in the mucosa similar to inflamed appendix [20].

CONCLUSION

The diagnosis of acute appendicitis is established at the expense of the surgeon's clinical findings. The basic laboratory investigations including the WBC and CRP levels are helpful and strengthen the clinical decision. Our study shows that ultimately that clinical decision of acute appendicitis is reasonably accurate. Intraoperative diagnosis based on gross appearance is very important to avoid unnecessary exploration of abdomen. Even though here shows rather over diagnosis intraoperatively, it carries a reasonably high accuracy that is able to avoid much of unnecessary exploration of abdomen.

So, our study concludes that clinical diagnosis which consists of clinical features and preliminary investigations along with intra operative observation is enough for diagnosis of acute appendicitis. It is mandatory to send the appendix for histology in order to confirm the clinical diagnosis as well as find other possible abnormalities like carcinoid tumors as we found here. We found that reactive lymphoid hyperplasia is common in our setup which warrants further studies to find out the cause for it.

As negative histology was more common among young females, it is very important to consider possible gynecological causes as top differential diagnosis for that age group.

The study was conducted in accordance with the ethical standards of the relevant national and institutional ethic committees.

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