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ANALYSIS OF HISTOPATHOLOGICAL SPECIMENS OF ACUTE APPENDICITIS DIAGNOSIS PARALLEL TO OTHER METHODS IN SAUDI ARABIA

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Abstract:

Objective: *We conduct this study in order to compare the results of different methods used in acute appendicitis diagnosis with histopathological findings.*

Background: *The diagnosis of acute appendicitis is mainly clinical and to confirm the diagnosis ultrasonography (USG) and Computerized Tomographic Scan (CT) are performed. Intraoperative findings are a certain indication of the actual diagnosis and for more confirmation histopathology is required.*

Method: *136 patients were included in this cross-sectional based study in Saudi Arabia. We analyses the results of clinical diagnosis, CT scan, USG and intraoperative in compare to histopathological findings using SPSS software. We considered "p-values" <0.05 statistical significance.*

Results: *We included 136 patients, 72 (52.9%) were males and 64 (47.1%) were females, their mean years of age were 30.9 (11.83). Average hours of hospital stay were 34.29 (34.88). The mean of WBCs and neutrophils count in male patients was 10.8 (4.19) and 7.62 (4.11) respectively. There was no statistically significant difference between CT and intraoperative findings as well as clinical diagnosis when compared with histopathological findings. On the other hand, significant difference was found between USG and histopathology.*

Conclusion: *We need further researches in the use of USG in diagnosis of acute appendicitis.*

Keywords: *Acute Appendicitis, Diagnosis, Histopathology, CT Scan, Ultrasonography.*

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INTRODUCTION:

The most popular emergent abdominal pain needing surgical interference is " acute appendicitis " with an incidence of 7% of general population under the age of 40 years old with a female to male ratio 3: 2 [1-3]. Negative appendectomy rates are high and may reach up to 20% as reported in some literatures and Perforation rates may reach up to 35% when operation is delayed and this increase the risks of widespread, painful inflammation of the lining of the inner abdominal wall, blood sepsis and death [4-9].

Diagnosis is still a different process although the high incidence rate due to absence of usual clinical manifestations and blood results in about 55% of presented cases with high percentage of missed diagnosis between 20:40 % [10-15]. Abscess, perforation, sepsis and intra-abdominal adhesions are severe complications that may result; ligation and hospital stay may also be needed.

Flum et al [15] said that patients with negative appendectomy complains usually from infections, post- operative complications due to hospital stay. In last years, negative appendectomy rates were decreased with the appropriate use of computed tomography (CT) and ultrasonography (USG) to help the diagnosis of acute appendicitis [4,5]. Accurate and early diagnosis of acute appendicitis is needed to avoid complications in non- operable cases and unnecessary surgical procedures.

In this study, our target is to analyses of the results of different methods used in Saudi hospitals to diagnose appendicitis. We include results of clinical, laboratory tests, radiological imaging and intraoperative findings in comparison to histopathology.

METHODS:

Study Setting

In this cross-sectional study, 136 patients, who were admitted to the emergency units in Saudi Arabia and clinically diagnosed with acute appendicitis.

Selection Criteria

All Patients with suspected acute appendicitis that visited the hospital during the period of the study were included with no restrictions to gender, race, color, religion or nationality. Exclusion criteria were: 1) hepatobiliary diseases, 2) hemolytic diseases, 3) alcoholic patients, 4) certain infectious diseases.

Data Collection and Laboratory Methods

We collected the data about lab results, diagnosis and general information from patients' medical records.

Statistical Analysis

We performed statistical analyses using SPSS 24 for Windows (SSPS Inc., Chicago, IL, USA). Chi square, and Fisher's exact test were applied. In order to compare the mean of age, gender, the test variables WBC and their application when predicting perforated appendicitis, receiver-operating characteristic (ROC) curves were created for each endpoint. When Two-sided "p- values" was <0.05 we considered it statistical significance.

RESULTS:

We included 136 patients, 72 (52.9%) were males and 64 (47.1%) were females, their mean years of age were 30.9 (11.83). Average hours of hospital stay were 34.29 (34.88). The mean of WBCs and neutrophils count in male patients was 10.8 (4.19) and 7.62 (4.11) respectively (table 1).

There were 17 patients diagnosed without performing histopathological procedures.

In table 2, we compare the results of histopathology and diagnosis by specialist, which shows a significant different between those 2 methods of appendicitis diagnosis. There were 39 histopathologically diagnosed with early acute appendicitis with intraluminal and mucosal inflammation as well acute appendicitis when diagnosed by specialist. In table 3, there was a significant difference between both histopathology diagnosis and USG findings. 55 patients were diagnosed with early acute appendicitis with intraluminal and mucosal inflammation according to histopathology specimen and acute appendicitis when diagnosed by specialist and while in table 4,5 no significant differences between CT finding and intraoperative and histopathology. However, there were some differences in the diagnosis between the 2 methods and the histopathological analysis of specimen and those differences when we perform chi-square test has no statistically influence. We also compare CT and intraoperative findings and no significant differences were detected (table 6). Although, there were patients diagnosed normally with CT and when the surgery was done, surgeons found with different types of appendix diseases.

Table 1: Participants' characteristics

Variables	Value
Total	136
Gender (Males/females)	72 (52.9%)/64(47.1%)
Age: mean (SD)	30.9 (11.83)
Hospital stay in hours: mean (SD)	34.29 (34.88)
WBCs count: mean (SD)	10.8 (4.19)
Neutrophils count: mean (SD)	7.62 (4.11)

Table 2: Diagnosis by a specialist and histopathology

DIAGNOSIS BY A SPECIALIST					
	Acute abdomen	**Acute appendicitis**	**Appendicular Mass**	**Acute appendicitis with Right renal colic**	**AGE with acute appendicitis**
HISTOPATHOLOGY					
Early acute appendicitis with intraluminal and mucosal inflammation	26	39	7	1	0
Acute suppurative appendicitis	7	11	1	0	0
Gangrenous appendicitis	3	7	0	0	0
Perforated appendicitis	1	10	0	0	0
Not performed	5	11	0	0	1

p-value 0.351

Table 3: USG findings and histopathology

USG FINDINGS					
	Normal/negative	**Appendicitis**	**Other diagnosis**	**Advised other investigations**	**Not performed**
HISTOPATHOLOGY					
Normal appendix without any gross pathologic changed.	1	0	0	0	0
Early acute appendicitis with intraluminal and mucosal inflammation	10	55	3	7	2
Acute suppurative appendicitis	2	7	5	1	4
Gangrenous appendicitis	1	8	0	0	1
Perforated appendicitis	2	4	2	1	3
Not performed	0	7	3	3	4

p-value 0.003**

Table 4: CT findings and histopathology

CT FINDINGS				
	Normal/negative	**Appendicitis**	**Other diagnosis**	**Not performed**
HISTOPATHOLOGY				
Normal appendix without any gross pathologic changed	0	0	0	1
Early acute appendicitis with intraluminal and mucosal inflammation	3	42	3	29
Acute suppurative appendicitis	0	7	3	9
Gangrenous appendicitis	1	5	1	3
Perforated appendicitis	1	5	2	3
Not performed	1	6	4	6

p-value 0.213

Table 5: Intraoperative findings and histopathology

INTRAOPERATIVE FINDINGS				
	Appendicitis	**Complicated appendicitis**	**Appendicitis with other finding**	**Notes not available**
HISTOPATHOLOGY				
Normal appendix without any gross pathologic changed	1	0	0	0
Early acute appendicitis with intraluminal and mucosal inflammation	28	21	17	8
Acute Suppurative appendicitis	9	-	5	1
Gangrenous appendicitis	8	2	0	0
Perforated appendicitis	7	2	3	0
Not performed	13	2	0	1

p-value 0.131

Table 6: Intraoperative findings and histopathology

INTRAOPERATIVE FINDINGS				
	Appendicitis	**Complicated appendicitis**	**Appendicitis with other finding**	**Notes not available**
CT FINDINGS				
Normal/negative	3	1	1	1
Appendicitis	33	11	15	4
Other diagnosis	8	3	0	1
Not performed	21	15	9	4

p-value 0.46

DISCUSSION:

We included 136 patients, 72 males and 64 females in a cross-sectional based study, their mean years of age was 30.9 (11.83). Average hours of hospital stay were 34.29 (34.88).

White Blood Cells (WBCs) and Neutrophils Count:

One of the most common methods of investigations of acute appendicitis is the white cell count, and it has been studied well before. Increase of number due to response to any inflammation and that means it is used within limits in differential diagnosis of appendicitis [16].

Shogilev et al [17] has studied the ratio of sensitivity, specificity, likelihood and overall accuracy of WBCs in diagnosis of acute appendicitis. The studies used varied WBC cut- off value with unclear conclusions on what cut-off point is best in the appendicitis context. A WBC cut off value of higher than 10,000: 12,000 cell /mm^3 yielded sensitivity values in a range of 65% and specify values of 32% and 82%. Neutrophilic count may be an indication for the differential diagnosis of appendicitis [18].

In table 1, it is clear that WBCs and neutrophils is elevated than normal but a recent review has reported that WBCs count is not adequate to predict appendicitis alone, so we should not depend on it for further management or diagnostic workup on it is own [19-23].

Clinical Diagnosis and Intra-Operative Findings

In table 2, there were no statistically significant differences between histopathological finding and intraoperative findings in table 4. The diagnosis of appendicitis is clinically but some lab tests and radiological imaging to confirm the diagnosis [24] and our results confirming that.

Radiological Imaging

The most accurate diagnostic test of appendicitis is "CT" with sensitivity and specify range of 83%: 98% so we could decrease negative appendectomy rates to less than 10%. Literatures say that ultrasound scanning (USS) is a popular imaging method and most accurate for confirming the appendicitis diagnosis [25].

Both methods have common problems as operator dependent variability, and visibility difficulties of the appendix due to body mass index, overlying body gases and variation in anatomy. CT problems are high exposure to ionizing radiation, contrast related complications and relative high costs. We made efforts to limit CT high levels of radiation with low CT imaging [26].

Kim et al [26] examined the use of abdominal CT with low dose to evaluate suspected appendicitis. They performed a single center study on 891 of adolescents and young adults, their results were that low dose CT and standard CT had an equal negative appendectomy rates and no major differences in perforation rates. Other studies have similar results.

By evidence, USG is preferred in children as well as pregnant and breast-feeding women. Specific USG criteria and repeated CT scans have been adopted to increase the sensitivity of diagnosis and to avoid radiation. That has improved USG diagnostic accuracy to reaches 100% [27-33] but our results showed significant differences between both USG and histopathological findings and this may be due to our small sample size.

Some recommended the use of (USG-Ct pathway) in cases with appendicitis to perform the surgery without CT need. CT scans are employed in equivocal cases [34].

Also, Poortman et al [35] that analysed 151 cases of suspected appendicitis. Of 79 cases with positive USG, 71 patients had confirmed appendicitis. Cases with inconclusive or a negative USS got a CT scanning with 21 were positive appendicitis. So, USS is useful in diagnosis of suspected cases and CT scanning for unequivocal cases can reliably pick up cases with negative USS. Another study with (620 children, USG equivocal) some got a follow up CT while others were under observation, with no missed diagnosis [36,37].

CONCLUSION:

Our purpose of this article was to present the evidence considering methods of diagnosis that are currently used in KSA when compared with histopathological finding. So, we include discussions of blood testing, radiological ima0ging as well as intra-operative findings.

In conclusion, diagnosis in adults depends on raised laboratory markers (WBCs and neutrophils) used in suspicious of appendicitis. They cannot be used alone, so no surgical interference will be made in this case.

When used together they show great benefit. We also think that many novel markers will be adopted successfully in near future, so future research will determine their effectiveness. And the best radiological method in diagnosis of appendicitis is still CT with major concern to long-term cancer risks and radiation exposure. We could increase accuracy and reach the sensitivity to 100% by using USG-CT.

We suggest widespread consideration of using low-radiation CT that has proven repeatedly to equal sensitivity of normal CT or repeated USG. The accurate sequence for imaging pathways are yet not determined. We recommend having further researches on the use of USG in appendicitis and its accuracy.

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