

## Comparative Value of Peritoneal Aspiration Cytology and Blood Counts in Diagnosing Acute Appendicitis

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### Abstract

Comparative value of Peritoneal aspiration cytology (PAC) and Total leucocyte count (TLC) estimation in the same patient population has never been investigated in acute appendicitis. This study is aimed at the same. Fifty consecutive patients presenting to one surgical division with suspected acute appendicitis underwent single time TLC estimation and PAC. Subsequently, all patients underwent appendectomy and histology findings were correlated with TLC and PAC results. For PAC, forty-one had a positive result, six had a negative result and aspiration failed in three cases. Forty of the 41 patients with a positive PAC had histology proved appendicitis. Three of the six patients with negative result had acute appendicitis. The sensitivity and specificity of PAC for acute appendicitis were 93% and 75%, respectively. The positive and negative predictive values were 97.5% and 50%, respectively. TLC ranged from 6700 to 23000 per cu. mm. Thirty-one patients (62%) had a TLC > 10,000 per cu. mm. of which 30 (96.7%) had histology proved appendicitis. Out of 45 patients with proved acute appendicitis 30 (66.6%) had increased TLC. In other words, the positive and negative predictive values of TLC were 96.7% and 21%, respectively while its sensitivity and specificity were 66.6% and 80%, respectively. PAC is superior to one time estimation of TLC as a diagnostic aid in acute appendicitis although a negative result does not exclude this diagnosis.

### Key Words

Peritoneal Aspiration Cytology, Total Leucocyte Count, Appendicitis

### Introduction

Acute appendicitis is one of the commonest surgical emergencies. The condition needs to be diagnosed early as risk of perforation is real and life threatening. As a routine the diagnosis of acute appendicitis is made on the clinical grounds and patient is subjected to appendectomy. In many such situations the appendix is found to be normal. This is known as negative appendectomy. Overall, the negative appendectomy rate varies between 25 to 40% (1-4). In the past this has been regarded as essential to keep the morbidity and mortality low from appendicular perforation peritonitis (5-7). However, negative appendectomy is associated with significant morbidity in about 15% of patients (1,8). To increase the diagnostic accuracy of acute appendicitis a

host of adjunctive tests have been advocated (9-11). Naturally, the choice of adjunctive test will depend not only upon the diagnostic accuracy of the modality but also the availability of the facility and the expertise. Thus, Computed tomography (CT) or Ultrasonography (USG) may well be the imaging tests of choice in institutions where these are available round the clock. However, in absence of such facilities, surgeons may have to depend upon readily available investigations like estimation of TLC and PAC. Individually both these investigations have been found useful in increasing diagnostic accuracy but their comparative value in the same patient population has not been determined. This study aims at the same.

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## Material and Methods

This prospective study, conducted after obtaining approval of the Ethical Committee of this Institution, was carried out over a period of 9 months in one of the surgical divisions of Department of Surgery at UCMS and GTB Hospital. During this period 57 patients were admitted with clinical diagnosis of acute appendicitis. Seven of these were excluded either because of pregnancy (4 cases) or previous laparotomy (3 cases). Remaining 50 consecutive patients formed the study group. In all these 50 patients a formal decision was taken to perform appendectomy on emergency basis. Blood sample was collected and processed for TLC in all patients immediately. Thereafter, the patients were shifted to operating room where cefotaxime (1gram) was administered intravenously. Patients were given general anesthesia and PAC was performed using the method described below. All patients underwent appendectomy through oblique gridiron incision in right iliac fossa.

TLC was estimated using Coulter electronic counter. PAC was performed by modifying the technique described by Vipond *et. al.* (12). A 16 G intravenous cannula was inserted into the peritoneal cavity at the pre-selected site of maximum tenderness in the right iliac fossa. Through this cannula an 18 G venous cut down catheter was manipulated in to the peritoneal cavity and peritoneal fluid was aspirated. In case no aspirate was obtained 5-10 ml of saline was injected through the catheter and was aspirated back after 30 seconds. The aspirate was smeared on to the clean glass slides and the slides were air dried before being fixed in 95% methanol. The slides were stained with May-Grunwald-Giemsa stain and examined under the microscope for the cell count. TLC > 10,000/mm (3) and neutrophils constituting more than 50% of the nucleated cells (16,17) in PAC slides constituted positive tests.

## Results

Fifty patients with a clinical diagnosis of acute appendicitis formed the study group. Forty-one were

males. All patients were studied according to aforementioned protocol and underwent emergency appendectomy. Forty-five patients had histology proved acute appendicitis; one of these was tubercular and in two cases appendix had become gangrenous. In five remaining patients a cause for acute abdominal pain could not be found.

TLC ranged from 6,700 to 23,000 per cu. mm. with a peak distribution in the range of 9,000 to 11,000 per cu. mm. (36%). Thirty-one patients (62%) had a TLC > 10,000 per cu. mm. of which 30 (96.7%) had a positive histology. The remaining 19 (38%) patients had TLC < 10,000 per cu. mm. of which 15 (78.9%) had acute appendicitis. In 45 patients with proven acute appendicitis 30 patients (66.6%) had a positive TLC.

PAC revealed 41 positive results and out of the nine negative results three were due to technical failure (two cases of bowel and one case of anterior abdominal wall blood vessel puncture). There was no increase in postoperative mortality or morbidity in any of these three cases but these cases were excluded from the statistical analysis. Forty (97.5%) of the 41 PAC positive patients had acute appendicitis. In the remaining one case no pathology was demonstrable. Of the six cases with negative PAC three had acute appendicitis.

The overall statistical comparison for various diagnostic modalities is summarized in the Table I.

**Table I : Results of this Study.**

Investigation	Sensitivity	Specificity	Predictability	
			Positive	Negative
TLC	66.6%	80%	96.7%	21.0%
PAC	93%	75%	97.5%	50%

## Discussion

The diagnosis of acute appendicitis is primarily based on clinical symptoms and signs. The traditional teaching is to 'explore and see' in case of any doubt rather than 'wait and watch' because of the risk of perforation and associated high morbidity. The drawback of this policy is an unacceptably high negative appendectomy rate as



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diagnostic accuracy varies between institutions (rates in Ontario ranged from 50% to 96.7%) (18). The surgeons try to tackle this problem by using certain investigations as an aid to the diagnosis.

Clinical and Computer aided algorithms as diagnostic aids are based on the classical clinical signs and abnormal laboratory findings. Ohmann *et. al.* (19) evaluated the performance of 10 different diagnostic scoring systems for acute appendicitis in 1254 patients. The authors believed that an acceptable scoring system should fulfill the following criteria : a negative appendectomy rate of less than 15%, a perforated appendix rate of less than 35%, a missed perforation rate of less than 15%, and a missed appendicitis rate of less than 5%. Alvarado score (20) was the only scoring system that fulfilled all four criteria. Moreover, these have never been shown superior to the clinical impression of an experienced clinician.

Several authors have proposed the use of laparoscopy as a diagnostic modality in the evaluation of a patients suspected of having acute appendicitis (21-23). Chief drawback of this is that patients with a normal appendix are exposed to the risk and cost of general anesthesia and diagnostic laparoscopy. Moreover inflammation has been shown to be present on histology in the appendices that appeared normal to the surgeons (24).

The role of imaging studies in acute appendicitis lies in differentiating presence of disease in those with inflammation, without perforation, and with equivocal clinical findings. Of course, the method itself should be quick, non-invasive, accurate and easily available at any hour. USG is one such imaging investigation. However, the debate regarding its usefulness continues and opinions vary from recommending this study in all patients to questioning its use due to added cost without improved clinical outcome (25,26).

CT is another imaging investigation and has been shown to be a better choice except in children or women with first trimester pregnancy (27). However, an enhanced cost, radiation exposure, exposure to the

contrast agents and limited availability beyond routine hours in all the hospitals constitute its main drawbacks.

In institutions where non-invasive diagnostic modalities (CT and USG) are not available round the clock, surgeons have to depend upon alternative investigations to enhance the diagnostic accuracy of acute appendicitis. We believe that PAC and TLC are two such investigations, which fulfill these criteria. A number of reports are available which demonstrate of efficacy of PAC and TLC in reducing the negative appendectomy (17, 28).

In the present study, 66.6% patients with proven appendicitis had raised TLC. These are relatively low figures in comparison to other studies (13,29,30). This could be because of many reasons such as smaller sample size and one time estimation of blood counts as counts are known to increase with the passage of time in inflammatory conditions. TLC exhibited high (96.7%) positive predictability rate, and this is similar to the findings of other authors thereby suggesting that surgical exploration is advisable in clinically doubtful cases if the counts are high (15). A large number of patients with false negative TLC (78.9%) cases suggest that clinical findings should be given due importance in the presence of normal blood counts. Also, the low sensitivity (66.6%) of the TLC precludes its use as the diagnostic investigation of choice, especially when not performed serially. Therefore, patients with equivocal clinical findings and normal count may be observed carefully thereby minimizing high negative appendectomy rate.

PAC showed a higher sensitivity rate (93%) but a lower specificity rates (75%) as compared to TLC in this study. This means that PAC, like TLC, may be positive in other inflammatory conditions affecting the lower abdomen, such as acute salpingitis. This is the chief drawback of this investigation which otherwise may become the investigation of choice for the diagnosis of acute appendicitis on account of very high positive (97.5%) as well as negative (50%) predictability rates.



There was no observed increase in the morbidity or mortality either from abdominal puncture for PAC (47 cases) or vascular and bowel puncture (3 cases). It is concluded that although one time estimation of TLC correlates well with the diagnosis of acute appendicitis when positive PAC is superior. However, the negative result of any of these investigations should be reviewed in light of the clinical features.

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