

Original Article**Focused Computed Tomography for the Evaluation of Suspected Appendicitis****Ganesh Devkota^{1*}, Mahesh Gautam¹, Pratikshya Tripathi², Sandeep Acharya¹**¹Department of Radiology, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal²Department of Nursing, Nobel Medical College and Teaching Hospital, Biratnagar, NepalArticle Received: 20th May, 2025; Accepted: 8th July, 2025; Published: 31st July, 2025**DOI: <https://doi.org/10.3126/jonmc.v14i1.83256>****Abstract****Background**

A focused computed tomography scan serves as a critical diagnostic modality for acute appendicitis, particularly in instances where clinical findings are equivocal or ultrasound results lack clarity. This study was carried out to assess the diagnostic accuracy of Focused Appendiceal Computed Tomography as a viable alternative to the conventional Computed Tomography of the abdomen and pelvis in patients suspected of having acute appendicitis.

Materials and Methods

Prospective cross sectional study of 100 adults were performed with suspected acute appendicitis. Each patient underwent a Computed Tomography of the abdomen and pelvis with both oral and intravenous contrast. A subset of axial images, ranging from the top of the L4 vertebral body to the roof of the acetabula, was extracted from each scan to create the Focused Appendiceal Computed Tomography. After reviewing the focused Appendiceal Computed Tomography images, the conventional Computed Tomography of the abdomen and pelvis scans were also evaluated, with each patient serving as their own control. The images were analyzed to determine their ability to identify the appendix, diagnose appendicitis, or detect alternative conditions that could explain the presenting symptoms.

Results

Out of 100 cases, the appendix was visible in the Focused Appendiceal Computed Tomography scans of 92 patients. In 8 cases, the appendix could not be visualized in either the focused or standard Computed Tomography of the abdomen and pelvis scans. Out of the 100 cases scanned, 63 cases were abnormal and 37 cases were normal. Among 63 abnormal cases, Focused Appendiceal Computed Tomography identified 42 cases of acute appendicitis, which was consistent with the findings from the standard Computed Tomography of the abdomen and pelvis. Additionally, 21 patients were found to have alternative diagnoses.

Conclusion

In this study Focused Appendiceal Computed Tomography provided identical diagnostic results. There is no difference in performance between Focused Appendiceal Computed Tomography and Conventional Computed Tomography of abdomen and pelvis in diagnosing of acute appendicitis in this study.

Keywords: *Appendicitis, Computed Tomography, Diagnostic Imaging*

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Introduction

Acute appendicitis is one of the most frequently diagnosed conditions in acute care surgery, with an incidence of 84.2 per 100,000 people [1]. The clinical presentation can sometimes be vague, with non-specific signs, leading to diagnostic delays, which can result in complications such as perforation, resulting in increased patient morbidity [2]. Multiple studies, including one by Drake et al., have shown that the use of diagnostic imaging reduces negative appendectomies without significantly affecting perforation rates between 2006 and 2011 [3].

Computed Tomography (CT) is generally more accurate than ultrasound (US) for diagnosing acute appendicitis and is preferred by the American College of Radiology (ACR) [4-5]. The standard protocol includes CT imaging of the abdomen and pelvis with both IV and oral contrast [6]. A significant limitation of CT is its exposure to ionizing radiation. However, advancements in CT technology have led to lower radiation doses while improving diagnostic accuracy. To further minimize radiation exposure in suspected acute appendicitis cases, Focused Appendiceal CT (FACT) has been proposed, though results have been mixed [7-10].

This study aimed to assess whether Focused Appendiceal CT with both oral and IV contrast could be an effective alternative to the standard Computed Tomography of abdomen and pelvis (CT-AP) in diagnosing acute appendicitis in adult patients.

Materials and Methods

This prospective observational study was conducted in department of radiology of Nobel medical college for one year from January 2021-December 2021 after getting ethical clearance from the institutional review committee (IRC no:376/2020). Informed consent was taken from all the enrolled patients after a detailed explanation of the study. All patients, of age more than 18 years, referred to the Radiology department for CT abdomen and pelvis with clinical suspicion of acute appendicitis were included in this study. Patients under the age of 18 and those with pre-existing disease like Crohn's disease were excluded from the study. A convenient sampling technique was used for patient selection. The sample size was calculated using the following formula: $n = Z^2 pq / e^2 = (1.96)^2 \times 0.13 \times 0.87 / (0.075)^2$; where n=minimum required sample size, Z= 1.96 at 95% confidence interval (CI) p=prevalence of acute appendicitis taken from

previous studies as 13.09% [11]. Eighty-seven was the estimated sample size. Nonetheless, during the research period, 100 samples were taken into account.

All patients underwent routine CT of the abdomen and pelvis (CT-AP) with both oral and intravenous (IV) contrast using 128 slice Siemens Somatoform scanner. Patients were given 500 cc of diluted Gastrografin 37% solution orally one hour before the scan. The scan covered the area from the diaphragm to the ischial tuberosities. 80 ml of the omnipaque was given as I/v contrast. A subset of axial, images was obtained, spanning from the top of the L4 vertebral body to the roof of the acetabula. Sagittal and coronal reformats of the same area were also produced. These images were used to create the focused appendiceal CT for analysis. The evaluation of appendix visualization on a focused CT scan involved determining whether the appendix was visible or not. And whenever visible it was determined that whether it was visualized fully or partially. Findings on FACT (Focused Appendiceal Computed Tomography) scans indicative of acute appendicitis were defined by the presence of at least one of the following criteria: (1) an appendiceal outer-to-outer diameter exceeding 6 mm; (2) peri-appendiceal free fluid; (3) fat stranding surrounding the appendix; (4) evidence of phlegmon; or (5) formation of an abscess. The criteria for negative appendicitis included a thin walled appendix with a diameter of less than 6 mm, with no peri-appendiceal inflammation. If the appendix was not visualized on the CT scan, the absence of peri-appendiceal inflammation was considered negative for appendicitis. All focused CT and CT-AP were analyzed by two Radiologists with experience of more than 3 years and the findings were recorded independently and final diagnosis was reached with mutual understanding.

The data were entered into and analyzed by using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistic in the form of frequencies, percentages were used to describe relevant data.

Results

In the 100 cases scanned, focused appendiceal CT successfully identified the appendix in 92 number of cases. Despite reviewing images of the entire abdomen, appendix could not be identified in 8 cases. Among 92 cases, the appendix was fully visible in 85 patients, partially visible in 7 patients.



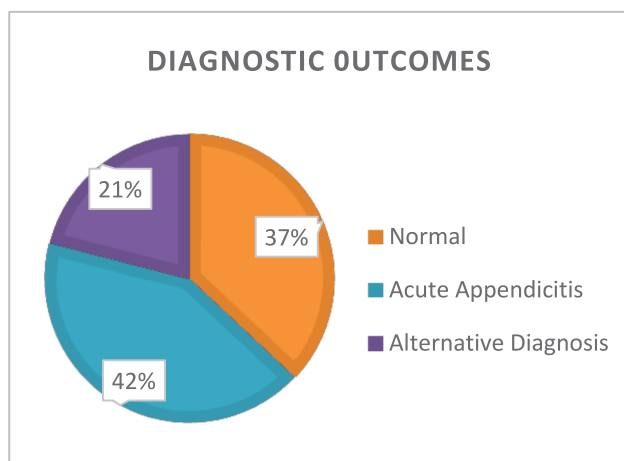


Figure 1: Diagnostic outcome among 100 cases

Out of the 100 cases scanned, 63 cases were abnormal and 37 cases were normal. Of the 63 abnormal scans, there were 42 cases of acute appendicitis, which accounted for 66.7% of the diseased cases. Other alternative diagnosis was established in 21 cases, which accounted for 33.3% of the diseased cases. Of the 42 scans positive for acute appendicitis, appendix was fully visualized in 36 and partially visualized in 6 with few millimeters missing from the scan. In 4 of these 6 cases, no significant additional findings, such as free air or abscesses, were detected outside the scan's field upon review. However additional findings were detected in 2 cases on reviewing the CT-AP. Appendicitis was confirmed by standard CT-AP in all the 42 cases.

In 21 cases, other acute conditions were diagnosed, including colitis in 8, ileitis in 5, epiploic appendicitis in 2, diverticulitis in 1, urinary tract issues in 2, and gynecological problems in 2, and an ilio-psoas abscess in 1. Both patients with urinary tract issues, had right distal ureteric stones. For the 2 patients with gynecological conditions, 1 was diagnosed with tubo-ovarian abscesses and the other with adnexal cyst.

In 5 of 21 cases with alternative diagnosis, the pathology was partially visualized with focused CT; however, it did not change the diagnostic accuracy. However, in one patient, focused appendiceal CT only revealed subtle thickening in the ascending colonic wall with minimal adjacent fat stranding and minimal free fluid. In the same case, CT-AP revealed, colitis involving the hepatic flexure and transverse colon.

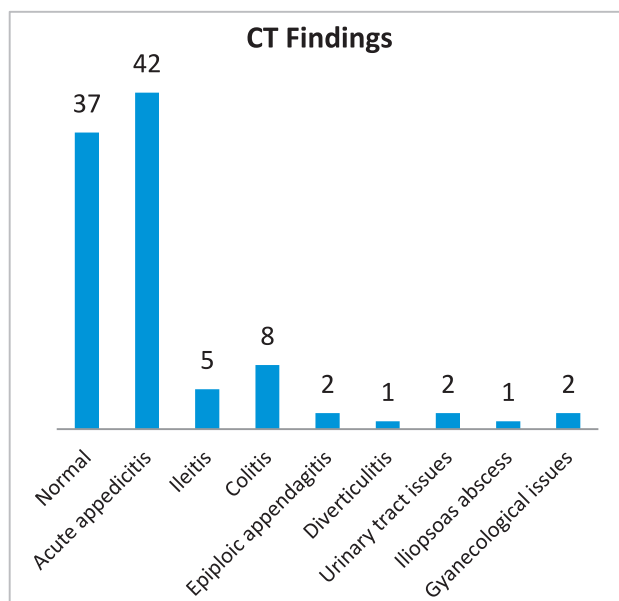


Figure 2: CT findings

Table 1: Frequency of FACT scan based diagnosis of acute appendicitis

Findings on FACT	Frequency (Percentage)
Peri-appendiceal fat stranding	35 (83.3)
Outer diameter more than 6mm	29 (69.04)
Peri-appendiceal fluid	19 (45.2)
Phlegmon Formation	5 (11.9)
Abscess formation	2 (4.7)

Table 1 shows the frequency of FACT scan based diagnosis of acute appendicitis among the 42 cases positive for acute appendicitis. The most prevalent FACT scan finding was peri-appendiceal fat stranding, observed in 35 patients (83.3%). An appendiceal diameter greater than 6 mm was noted in 29 patients (69.04%), while peri-appendiceal free fluid was detected in 19 patients (45.2%). Less frequently encountered findings included phlegmon formation in 5 patients (11.9%) and abscess formation in 2 patients (4.7%).



Figure 3: FACT scan demonstrating acute appendicitis



Figure 4: FACT scan demonstrating colitis

Discussion

Acute appendicitis remains one of the most common surgical emergencies, requiring prompt and accurate diagnosis to avoid complications. In recent years, the use of US and CT has significantly enhanced the diagnostic process, offering detailed imaging that aids in confirming appendicitis or ruling out alternative diagnoses. This study aimed to evaluate the effectiveness of focused CT in suspected cases of acute appendicitis, so that radiation exposure can be minimized. Several strategies have been proposed to, most notably by narrowing the field of view during CT scans. Some researchers suggest that a focused appendiceal CT scan could effectively diagnose acute appendicitis.

Rao et al. conducted a prospective study of 100 patients with suspected appendicitis, using focused CT with oral and rectal contrast but no IV contrast. Their scan focused on a 12–15 cm region about 3 cm above the cecum, achieving a sensitivity of 100%, specificity of 95%, a positive predictive value of 100%, and overall accuracy of 98% [8]. Fefferman et al. studied 93 pediatric patients with right lower quadrant pain using CT-AP (CT abdomen-pelvis) with both oral and IV contrast, dividing the scan into three regions. They found a sensitivity of 97% and specificity of 93% in the region below the right lower pole of the kidney [9]. Lane et al. examined 300 patients with suspected appendicitis, performing focused unenhanced CT from the T12 vertebra to the pubic symphysis, achieving a sensitivity of 96%, specificity of 99%, and accuracy of 97% [12]. Wijetunga et al. studied 100 patients in the emergency department with ambiguous symptoms, using focused CT with oral contrast in a 12–15 cm region of the right lower quadrant, achieving sensitivity of 93%, specificity of 97%, and accuracy of 96% [13].

However, some researchers argue that the

reduced sensitivity and specificity of focused CT, along with the potential risk of missing alternative diagnoses outside the scan's field of view, makes it less suitable. Jacobs et al. compared focused appendiceal CT (with oral contrast only) with the standard CT-AP (using both oral and IV contrast) in 228 patients. They found that the standard CT-AP had higher sensitivity and specificity, with four appendicitis cases that would have been missed by focused CT [6]. Similarly, Kamel et al. analyzed 100 patients with atypical appendicitis symptoms, using both CT-AP and pelvic CT alone, reporting an overall sensitivity of 88% [10]. Given the variations in study designs, inclusion criteria, imaging techniques, and contrast use, further research was deemed necessary. Many studies were based on heterogeneous patient groups, including those with suspected appendicitis, right lower quadrant pain, and atypical presentations, with referral sources also varying widely. Moreover, the regions scanned and the contrast protocols varied, and many studies were over 15 years old, before the advancements in CT technology.

Our study found that focused appendiceal CT, from the top of the L4 vertebral body to the roof of the acetabulum, offers high diagnostic accuracy for acute appendicitis, with both sensitivity and specificity at 100%. When compared to the gold standard CT-AP, there was no significant difference in the ability to visualize the appendix. No cases were missed, and only 7 cases had part of the appendix outside the scan's margins, with additional findings detected on CT-AP only in 2 cases. Although our study did not specifically analyze radiation exposure, previous research suggests that pelvic CT alone delivers less than half the radiation dose of a full CT abdomen-pelvis [14]. Thus, we estimate that focused appendiceal CT could involve about half the radiation exposure of CT-AP.

The limitations of this study include the absence of histopathological correlation, its design as a single-center study, and limited sample size. Despite limitations, the study offers valuable data that could shape future appendicitis diagnostics. It highlights the potential of Focused CT in acute appendicitis diagnosis, particularly in real-world settings, and provides a direct comparison with Conventional CT, shedding light on their effectiveness, and practicality. Additionally, it contributes to the growing knowledge of focused imaging techniques, which could reduce radiation exposure and improve diagnostic efficiency. Further study with larger sample sizes, and histopathological correlation would strengthen

the findings of this study.

Conclusion

Thus, from this study, we can conclude that focused abdominal computed tomography provides identical diagnostic results. There is no difference in performance between Focused CT and Conventional CT in diagnosing of acute appendicitis. A precise diagnosis of acute appendicitis can be achieved through focused appendiceal CT of the abdomen and pelvis using both IV and oral contrast.

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Conflict of interest: None

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