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# Study on the Application and Value of Multi-slice Spiral CT in Acute Appendicitis

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**Abstract:** *Objective:* To investigate the diagnostic value of multi-slice spiral CT (MSCT) for patients with acute appendicitis (AA). *Methods:* Fifty patients with suspected AA who visited the hospital from January 2023 to January 2025 were selected as samples. All patients underwent MSCT and ultrasound diagnosis, and the diagnostic efficacy of MSCT was analyzed in comparison with pathology. *Results:* Pathology indicated 40 positive and 10 negative cases, ultrasound indicated 30 positive and 20 negative cases, and MSCT indicated 39 positive and 11 negative cases. The diagnostic efficacy of MSCT was higher than that of ultrasound ($P < 0.05$). The accuracy of pathological classification of MSCT was higher than that of ultrasound ($P < 0.05$). The detection rate of MSCT imaging indicators in AA patients was higher than that in non-AA patients ($P < 0.05$). *Conclusion:* MSCT has high diagnostic efficacy in AA patients and can assist physicians in determining pathological classification.

**Keywords:** Acute appendicitis; Multi-slice spiral CT; Diagnostic efficacy

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## 1. Introduction

AA is a common acute abdominal disease in general surgery, mostly caused by pathogenic bacteria infection and appendiceal duct blockage. The symptoms include fever, tenderness, and lower abdominal pain, which are mostly treated by surgical removal of the diseased appendix. However, before surgical treatment, it is necessary to determine the location of the diseased appendix in AA patients, evaluate the degree of appendiceal suppuration and necrosis, and provide a basis for physicians to choose the type of surgery. Ultrasound is a commonly used diagnostic technique for AA, but its diagnostic accuracy is affected by intestinal gas, which may lead to unnecessary appendectomy or delayed treatment. Therefore, it is necessary to explore other imaging techniques for the diagnosis of AA. Based on single-slice spiral CT technology, MSCT acquires volumetric parameters of the appendix in the detection area and analyzes the correlation between diseased and healthy tissues from multiple angles and links [1]. However, MSCT has certain radiation, so repeated examinations require attention to prevention and control. Based on this, this study explores the diagnostic efficacy of MSCT using 50 patients with suspected

AA who visited the hospital from January 2023 to January 2025 as samples.

## 2. Materials and methods

### 2.1. Materials

A sample of 50 patients with suspected acute appendicitis (AA) who visited the hospital from January 2023 to January 2025 is selected. There were 29 males and 21 females, with ages ranging from 19 to 73 years old, and a mean age of (43.19 ± 2.44). The course of the disease ranged from 1 to 4 days, with a mean of (2.18 ± 0.43) days. Inclusion criteria are: Presence of tenderness in a fixed area of the right lower abdomen; Signed informed consent; Elevated white blood cell count. Meanwhile, the exclusion criteria are: Organ lesions; History of immunosuppressive drug use; History of hormone drug use; Psychiatric disorders.

### 2.2. Methods

(1) Ultrasound: The ultrasound probe is adjusted to 3.5–4.0MHz and placed on the point of tenderness in the right lower abdomen of the patient, gradually applying pressure during scanning to reduce interference from ascending colon and cecum gases, and to obtain clear imaging of the appendiceal lesion. Based on this center point, a wide range of scanning is performed to obtain information on the size, shape, echo, and adjacent tissues of the appendix, as well as blood flow signals in the appendiceal region using color Doppler imaging technology. AA is confirmed if the ultrasound indicated an appendiceal diameter ≥ 6mm, wall thickening ≥ 2mm, enhanced serosal echo, cessation of appendiceal peristalsis, increased blood flow in the appendiceal lesion, or detection of fluid in the appendiceal cavity.

(2) MSCT: Scanning is performed using a 64-slice multi-spiral CT scanner. Parameters are adjusted to acquire images from the second lumbar vertebra to the pubic symphysis region. For patients with a high suspicion of AA, 80ml of iohexol is injected at a rate of 3ml/s to obtain enhanced scan data. The data is then transmitted to a post-processing workstation for multi-planar reconstruction. AA is confirmed if MSCT indicated appendiceal wall thickening, appendiceal diameter > 6mm, visible exudate adjacent to the appendix, or thickening of the terminal ileum wall.

### 2.3. Statistical analysis

Data is processed using SPSS 21.0. Count data is recorded as percentages (%) and analyzed using the chi-square test ($X^2$ test). Measurement data is recorded as mean ± standard deviation ($\overline{X} \pm s$) and analyzed using the t-test. Statistical differences are considered significant at $P < 0.05$.

## 3. Results

### 3.1. Detection indicators

Pathology indicated 40 positive and 10 negative cases. Ultrasound indicated 30 positive and 20 negative cases, as shown in **Table 1**. MSCT indicated 39 positive and 11 negative cases, as shown in **Table 2**.

**Table 1.** Comparison between ultrasonic and pathological results (n,%)

| Ultrasound | Pathological Positive | Pathological Negative | Total |
|---|---|---|---|
| Positive | 23 | 7 | 30 |
| Negative | 17 | 3 | 20 |
| Total | 40 | 10 | 50 |

**Table 2.** Comparison between MSCT and pathological results (n,%)

| Ultrasound | Pathological positive | Pathological negative | Total |
|---|---|---|---|
| Positive | 38 | 1 | 39 |
| Negative | 2 | 9 | 11 |
| Total | 40 | 10 | 50 |

## 3.2. Diagnostic efficiency indicators

The diagnostic efficiency of MSCT is higher than that of ultrasound, $P < 0.05$, as shown in **Table 3**.

**Table 3.** Diagnostic efficiency indicators (n,%)

| Diagnostic method | Sensitivity | Specificity | Accuracy | Positive predictive value | Negative predictive value |
|---|---|---|---|---|---|
| Ultrasound | 57.50(23/40) | 30.00(3/10) | 52.00(26/50) | 76.67(23/30) | 15.00(3/20) |
| MSCT | 95.00(38/40) | 90.00(9/10) | 94.44(47/50) | 97.44(38/39) | 81.82(9/11) |
| $X^2$ | 15.5306 | 7.5000 | 22.3744 | 7.1360 | 13.3548 |
| *P* | 0.0000 | 0.0062 | 0.0000 | 0.0076 | 0.0003 |

## 3.3. Pathological classification indicators

The accuracy of MSCT pathological classification is higher than that of ultrasound, $P < 0.05$, as shown in **Table 4**.

**Table 4.** Pathological classification indicators (n,%)

| Diagnostic Method | Suppurative appendicitis | Simple appendicitis | Gangrenous appendicitis | Periappendiceal abscess | Accuracy rate |
|---|---|---|---|---|---|
| Ultrasound | 42.11(8/19) | 83.33(5/6) | 40.00(6/10) | 80.00(4/5) | 72.97(23/40) |
| MSCT | 94.74(18/19) | 100.00(6/6) | 90.00(9/10) | 100.00(5/5) | 97.30(38/40) |
| $X^2$ | - | - | | - | 15.5306 |
| *P* | - | - | | - | 0.0000 |

## 3.4. Imaging sign indicators

The detection rate of MSCT imaging indicators in AA patients is higher than that in non-AA patients, $P < 0.05$. The results are shown in **Table 5**.

**Table 5.** Imaging sign indicators (n,%)

| Group | Periappendiceal effusion | Thickening of cecum wall | Appendicolith | Ileocecal lymph node enlargement | Intestinal congestion |
|---|---|---|---|---|---|
| AA (*n*=40) | 35(87.50) | 38(95.00) | 34(85.00) | 35(87.50) | 12(30.00) |
| Non-AA (*n*=10) | 5(50.00) | 5(50.00) | 4(40.00) | 4(40.00) | 0(0.00) |
| $X^2$ | 7.0313 | 13.4551 | 8.8816 | 13.7730 | 3.9474 |
| *P* | 0.0080 | 0.0002 | 0.0029 | 0.0002 | 0.0469 |

## 4. Discussion

AA has a high incidence rate among acute abdominal diseases in general surgery. The typical symptom is tenderness at McBurney's point, while a few patients have non-specific manifestations, which can be easily confused with urinary calculi and gastroenteritis. Ultrasonic technology is commonly used in the diagnosis of appendicitis and other related diseases. It has the advantage of being non-radiative and can provide dynamic feedback on the location, morphology, structure, and echo of the appendix. This information can serve as a basis for physicians to evaluate appendiceal lesions. Additionally, ultrasonography is affordable and tolerable for most patients [2]. However, it is important to note that when AA patients undergo ultrasonography, the presence of excessive gas in the intestinal cavity or excessive abdominal wall fat can obstruct ultrasonic waves, reducing the detection rate of deep-seated diseases. Furthermore, ultrasonic results may be influenced by the subjectivity of the doctor, and the imaging quality can be affected by factors such as the scanning technique, intestinal gas accumulation, and abdominal pain, leading to missed diagnoses. MSCT, on the other hand, is a modern imaging diagnostic technique that offers advantages such as multi-level scanning and high-resolution imaging. It can clearly display the location and morphology of the appendix, and also observe changes in adjacent tissues, lymph nodes, fatty spaces, and fascia, facilitating accurate evaluation of AA pathological changes by physicians.

Based on the data analysis in this study, pathology indicated 40 positive cases and 10 negative cases, ultrasound indicated 30 positive cases and 20 negative cases, and MSCT indicated 39 positive cases and 11 negative cases. For patients with appendicitis (AA) undergoing MSCT diagnosis, there are several advantages: Firstly, MSCT technology provides high-resolution imaging, allowing for clear local images to be obtained. It enables multi-planar and multi-dimensional observation of local lesions. After collecting information, it can be transmitted back to the post-processing workstation for three-dimensional imaging, providing intuitive data for physicians to differentiate and diagnose AA. By observing the structure of the appendix and adjacent tissues, it can assist doctors in evaluating the scope of appendicitis lesions and the degree of inflammatory lesions [3]. Secondly, MSCT technology offers fast imaging speed and short scan time. The use of rapid reconstruction technology and multi-slice volume scanning technology to acquire abdominal imaging information can reduce scan time, improve abdominal comfort, and reduce the pain of abdominal examination for patients.

Shortening the scan time can also alleviate discomfort induced by the examination. In addition, MSCT technology's thin-slice scanning can enhance imaging clarity, facilitating the identification of early-stage AA patients by physicians. Finally, MSCT technology can assist doctors in completing preoperative evaluation and guiding the formulation of surgical plans. Another set of data shows that the diagnostic efficacy of MSCT is higher than that of ultrasound ($P < 0.05$). The reason for this is that MSCT technology utilizes the different absorption and attenuation of X-rays by different human tissues to generate images. It can complete a full abdominal scan

in just 16–19 seconds, resulting in images without motion artifacts. Furthermore, the use of post-processing techniques for three-dimensional reconstruction of the affected area allows for observation of the appendiceal lumen from different angles, providing continuous and complete images of the appendix. Precise evaluation through observation of indicators such as appendiceal shape, thickness, length, location, and extravasation results in high diagnostic efficacy, compensating for the limitations of two-dimensional imaging [4].

Additionally, during MSCT scanning, the thinnest multi-planar reconstruction image has a thickness of 0.5mm, which aids doctors in evaluating the appendiceal lumen and adjacent fine anatomical structures, facilitating the differential diagnosis of different AA types. Obtaining curved planar reconstruction images of the appendix can better reflect the relationship between the appendix and adjacent structures, thereby providing preoperative spatial conformation for the treating physician. Another set of data indicates that the accuracy of MSCT in pathological typing is higher than that of ultrasound ($P < 0.05$). The reason for this is that ultrasound technology, when used for the differential diagnosis of suspected AA patients, offers non-invasive and convenient features. It relies on differences in sound impedance between different tissues to generate images. By analyzing changes in imaging signs and hemodynamics, it can improve the accuracy of pathological typing diagnosis [5]. However, it is important to note that ultrasound alone, indicating hemodynamic changes, cannot accurately evaluate AA. Furthermore, ultrasound imaging can be easily influenced by various subjective factors, potentially leading to missed diagnoses or misdiagnoses [6].

MSCT technology combines the advantages of data acquisition and three-dimensional imaging, enabling the acquisition of three-dimensional and comprehensive imaging of the appendiceal region. By utilizing rotational scanning to obtain multi-layer imaging data, which is then transmitted back to a computer for three-dimensional reconstruction processing, it can generate three-dimensional images. This allows for the clear identification of the size, shape, location, and other data of the appendix, thereby assisting doctors in evaluating the pathological type of appendicitis [7]. The final set of data shows that the detection rate of MSCT imaging indicators is higher in AA patients compared to non-AA patients ($P < 0.05$). The reason for this is that in AA patients, inflammatory infiltration and edema can increase vascular permeability, causing plasma components to leak into tissues adjacent to the appendix. If the leakage is excessive, it can lead to the formation of local abscesses, aggravating appendicitis. Additionally, widespread leakage can worsen abdominal pain. Under the influence of fecal stone compression and inflammatory stimulation, inflammatory factors can spread to the cecum, stimulating edema and hyperemia of the cecal mucosa, promoting local tissue proliferation, and even blocking intestinal contents, leading to increased intestinal distension.

Due to factors such as intestinal secretions, bacteria, and food residues, a large amount of calcified fecal stones can deposit in the appendiceal lumen, increasing intra-appendiceal pressure and blocking appendiceal blood flow. This results in worsened appendiceal inflammation and increased difficulty in treatment. Continuous stimulation of inflammatory factors on the ileocecal lymph nodes can lead to their enlargement. If adjacent tissues are compressed, it can aggravate local pain and even cause systemic infection. The influence of fecal stones and inflammation can also worsen adhesions in tissues adjacent to the appendix, leading to intestinal obstruction and stenosis, blocking the passage of intestinal contents. This can induce intestinal distension, causing symptoms such as nausea, vomiting, abdominal pain, and abdominal distension, and may even lead to perforation and intestinal necrosis [8].

When performing MSCT diagnosis, observing increased density in the fat surrounding the appendix, appearing as cord-like or cloud-like structures with unclear boundaries, suggests the presence of diffuse or

localized extravasation signs. Observing high-density shadows in a cloud-like pattern indicates the spread of inflammatory factors to adjacent tissues. MSCT showing a cecal wall thickness greater than 3mm suggests diffuse or localized thickening of the cecal wall, and enhanced scan images can reveal local lesion enhancement. MSCT indicating high-density shadows in the appendiceal lumen, appearing as block-like or punctate structures with a diameter limited to approximately 3–10mm, suggests the presence of appendicoliths, which can block the lumen and worsen appendicitis. MSCT showing lymph nodes with a diameter greater than 8mm, and enhanced scan images revealing local lesion enhancement, indicates enlargement of ileocecal lymph nodes, which is associated with multiple factors such as inflammatory stimulation, immune response, and infection spread. MSCT indicating cecal dilation or terminal ileum dilation, and observing slowed intestinal motility and the presence of air-fluid levels within the intestinal lumen, suggests the presence of intestinal distension [9].

To ensure diagnostic accuracy during MSCT examination, patients should fast for 4-6 hours before the examination to avoid the influence of intestinal fluids and food on MSCT imaging. If a patient's condition is critical, they can inform the radiologist and proceed with the examination directly. Before the examination, patients should remove any metal objects they are wearing, including phones, keys, and belts, to avoid the generation of artifacts under MSCT [10]. Additionally, due to the small number of suspected AA samples included in this study, there may be some coincidence in the MSCT diagnostic efficacy data. Further analysis of MSCT's diagnostic value should be conducted with an increased number of suspected AA samples in the future.

## 5. Conclusion

In summary, MSCT diagnosis of AA offers high diagnostic efficacy, can assist doctors in the classification of AA, and reveals distinct imaging features between AA and non-AA patients, making it a valuable tool for clinical application.

## Disclosure statement

The author declares no conflict of interest.

## References


[1] Jia X, 2024, Application Value of Multi-Slice Spiral CT in the Pathological Classification Diagnosis of Acute Appendicitis. China Minkang Medicine, 36(19): 128–130.

[2] Li S, 2024, The Application Value of Multi-Slice Spiral CT in the Diagnosis of Acute Appendicitis. Chinese and Foreign Medical Research, 3(5): 141–143.

[3] Zhou Z, 2024, Application of Multi-Slice Spiral CT in the Diagnosis of Acute Appendicitis. Modern Medical Imaging, 33(5): 899–901.

[4] Xu Y, Ma N, Xiao X, et al., 2024, The Value of Multi-Slice Spiral CT Combined with Ultrasonography in the Diagnosis of Acute Appendicitis. Journal of Translational Medicine, 13(10): 1559–1563.

[5] Wang J, 2024, Analysis of the Diagnostic Value of Multi-Slice Spiral CT for Acute Appendicitis. Modern Medical Imaging, 33(11): 2075–207.

[6] Shen J, Tang J, 2022, Clinical Value Analysis of Multi-Slice Spiral CT in the Diagnosis of Acute Appendicitis. Journal of Medical Imaging, 32(8): 1430–1432.

[7] Zang W, Wang J, Zhang J, et al., 2020, Application of Multi-Slice Spiral CT Plain Scan and Reconstruction Technique in the Diagnosis of Acute Appendicitis. Chinese Journal of Laboratory Diagnosis, 24(4): 605–606.

[8] Wang Q, 2021, Application of Multi-Slice Spiral CT Plain Scan and Reconstruction Technique in the Diagnosis of Acute Appendicitis. Imaging Research and Medical Applications, 5(6): 140–141.

[9] Liu Z, 2022, Research on the Application Value of Multi-Slice Spiral CT Plain Scan Combined with Reconstruction Technique in the Diagnosis of Acute Appendicitis and Its Complications. Imaging Research and Medical Applications, 6(20): 50–52.

[10] Peng L, Hu B, Mei L, et al., 2024, Diagnostic Application Value of MSCT in Acute Appendicitis. Journal of Medical Imaging, 34(9): 155–157.