

CT

1

,

■ ■ ■ ■ ■ ■

: CT ,

: 50 가 112
CT(- 5 - mm)

CT(- 5 - mm)

(6 mm),

§ § § § §

: (, 92%; , 93%; , 93%),

(, 68%; , 96%; , 88%),

(, 90%; , 79%; , 82%), (, 72%;

, 86%; , 82%), (, 16%; , 100%; , 74%),

(, 14%; , 100%; , 74%)

: CT ,

90%

가 ,

(2, 10 - 12).

(1). 가 , , Rao

가

(1, 2). CT(focused CT) 가 ,

CT (6, 7, 13, 14).

(negative appendecto - ,

my) CT, (3, 4). 가 (2, 5-

(3, 4).

가 (2, 5 -

CT 88 - 7, 9, 12, 14, 15).

100%	, 91% - 99%	, 94% - 98%	CT
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가 (5-11).

- 4 mm 5 mm

4 mm 5 mm

1

2002 4 23

2002 8 6

.

1 1 1 1 1

thickening), (arrowhead sign), cecal bar (6, 16 - 18).

CT (5 - 7, 9, 16 - 20).

CT (12), 가, (21 - 23).

CT 가 가

2000 3 12 CT 191

13 CT 162

16 13 - 83 CT

(35.1) , 85 , 77 . CT

5 , 61 , 96

50

112 Table 1

CT CT(HiSpeed Advantage; GE Medical Systems, Milwaukee, WI, U.S.A.)

7 mm 1, (120 kVp, 200 - 240 mAs)

15 cm

5 mm 1, (11). 7 mm (clustered data acquisition mode)

CT (300 [300 mg Iodine/mL]; ,) 120 mL 2 - 3 mL/sec 70

18 1.5% w/v (; ,) 600 - 900 mL 1 - 3 , 16 (2.5% sodium amidotrizoate and meglumine amidotrizoate, 가 ; ,) 30 600 - 800 mL 1 - 2 . 128

Table 1. Alternative Diagnoses in 112 Patients without Acute Appendicitis

Final diagnosis	No. of patients (%)
Nonspecific abdominal pain	49 (43.8)
Right-sided colonic diverticulitis	13 (11.6)
Mesenteric lymphadenitis	12 (10.7)
Ileocolitis with mesenteric lymphadenitis	7 (6.3)
Right ureteral stone	6 (5.4)
Ileitis with mesenteric lymphadenitis	6 (5.4)
Pelvic inflammatory disease	4 (3.6)
Right-sided colonic carcinoma	3 (2.7)
Ruptured ovarian cystic tumor	3 (2.7)
Ileocecal tuberculosis	3 (2.7)
Crohn 's disease	3 (2.7)
Intestinal ischemia	1 (0.9)
Sigmoid diverticulitis	1 (0.9)
Typhlitis	1 (0.9)

Numbers in parentheses are the percentages.

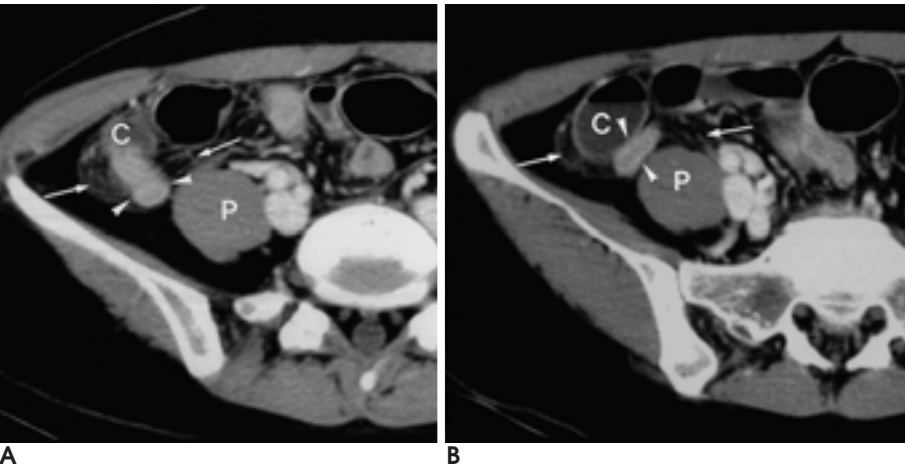


Fig. 1. Acute retrocecal appendicitis in a 31-year-old woman.
A, B. Contrast-enhanced CT scans show an enlarged proximal appendix with thickened and enhanced wall (ar-rowheads) between the cecum (C) and psoas muscle (P). Inflammatory strand-ing (arrows) is noted in periappendiceal mesenteric fat.

CT 3 CT CT CT 6
 mm), (no confident identification
 가 (peri-
 of the appendix), appendiceal fat stranding),
 가

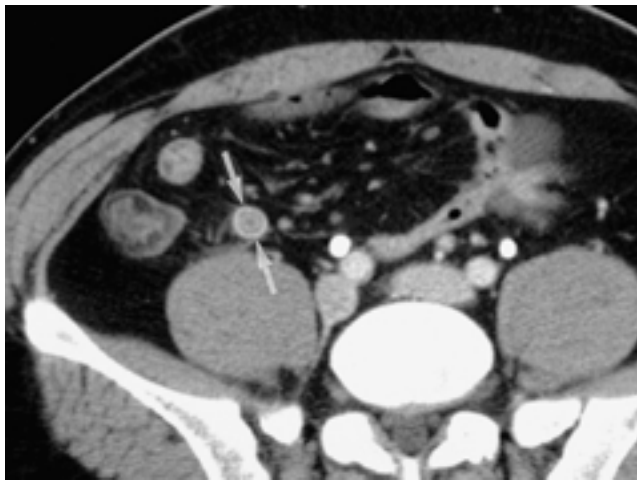


Fig. 2. Acute appendicitis in a 35-year-old man. Contrast-enhanced CT scan shows mural stratification enhancement ('target sign') of an inflamed appendix (arrows).

Chi-square test Fisher's exact
 test , p 0.05
 가
 ($p < 0.001$) (Figs. 1 - 5),
 ($p < 0.001$) (Figs. 1 - 5),
 ($p < 0.001$) (Figs. 1 - 4), ($p < 0.001$)
 (Figs. 1 - 5), ($p < 0.001$) (Fig. 3),
 ($p = 0.002$) (Fig. 5) (Table 2).
 가 (Fig. 6), (Fig. 4),
 92%, 93%, 93%,
 68%, 96%, 88%
 79%, 82%,
 72%, 86%, 82%
 16%, 100%,
 74% (Fig. 3),

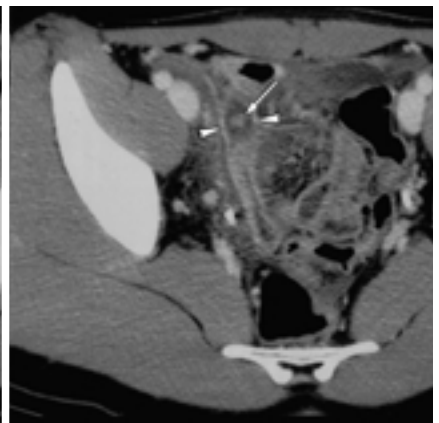
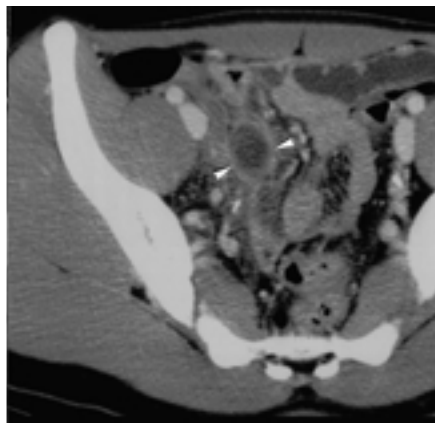
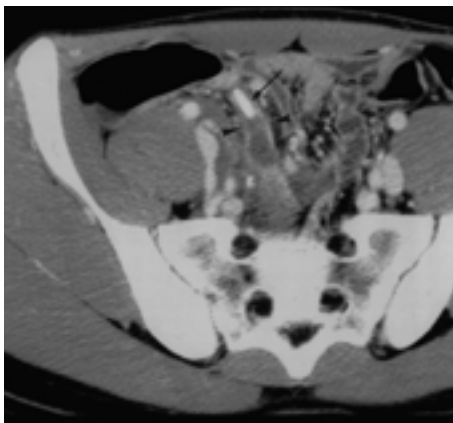
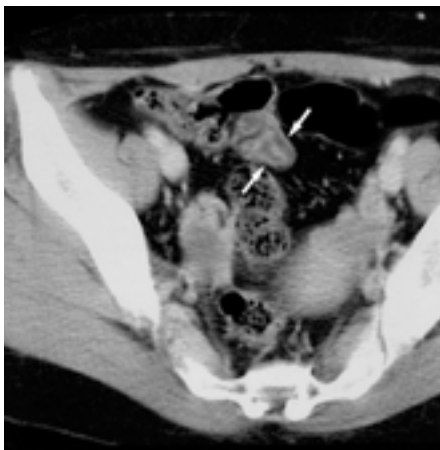


Fig. 3. Acute appendicitis in a 17-year-old man.
A. Contrast-enhanced CT scan shows a small calcified appendicolith (arrow) within mild inflamed proximal appendix (arrowheads).
B. Contrast-enhanced CT scan slightly inferior to A shows the more enlarged, distal appendix with thickened and enhanced wall (arrowheads).
C. In a more distal part of the inflamed appendix (arrowheads), another appendicolith (arrow) is seen.

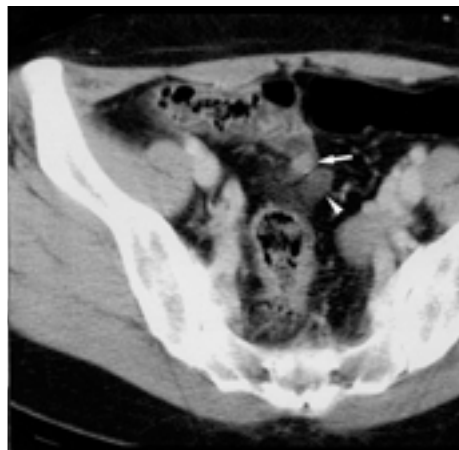
CT
 14%, 100%, 74% 가
 (Fig. 5).
 CT
 , 1 mm
 5 mm
 (2, 12, 21, 22,
 24 - 26).
 가
 CT
 (11),
 가 CT 가
 2 ,
 CT



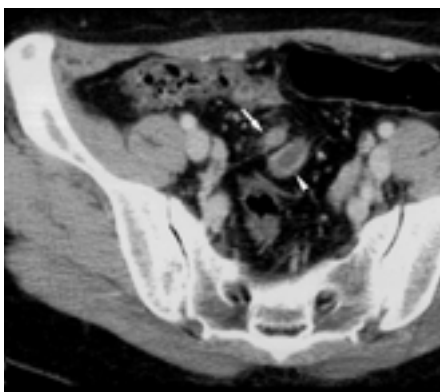
Fig. 4. Acute appendicitis in a 34-year-old man. Contrast-enhanced CT scan shows an inflamed distal appendix (arrow-heads) with intraluminal air bubble (thin arrow). Note moderate inflammatory stranding (thick arrow) in periappendiceal mesenteric fat.



A



B



C



D

Fig. 5. Acute appendicitis in a 32-year-old woman.

A. Contrast-enhanced CT scan shows focal wall thickening of cecal apex (arrows) at the origin of the inflamed appendix.

B-D. Contrast-enhanced CT scans show an enlarged, enhancing, hairpin-shaped appendix with mild inflammation of the proximal part (arrow) and moderate inflammation of the distal part (arrowhead). Inflammatory stranding is seldom noted in periappendiceal mesenteric fat.

(2, 12, 24).

(2, 24).

2 - 4 mm

(23).

(target sign)가

(2) (Fig. 2).

가

20%

가

가

(19).

(Fig. 4).

Balthazar

CT

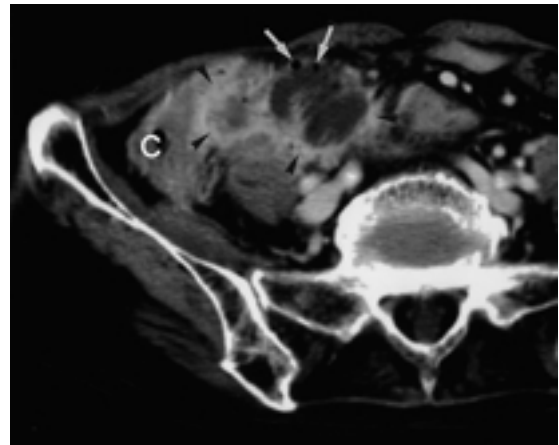


Fig. 6. Perforated appendicitis in a 65-year-old woman. Contrast-enhanced CT scan shows an abscess (arrowheads) containing two air bubbles (arrows) in the medial aspect of the cecum (C). Inflammatory changes are also seen in the adjacent mesenteric fat.

Table 2. Summary of Thin-Section Contrast-Enhanced CT Findings of Acute Appendicitis

CT findings	Sensitivity *	Specificity*	Accuracy*	p value [†]
Enlarged appendix	92	93	93	< 0.001
Appendiceal wall thickening	68	96	88	< 0.001
Periappendiceal fat stranding	90	79	82	< 0.001
Appendiceal wall enhancement	72	86	82	< 0.001
Appendicolith(s)	16	100	74	< 0.001
Focal cecal apical thickening	14	100	74	0.002
(Appendiceal) intramural air	4	100	70	> 0.05
Extraluminal air	16	95	70	> 0.05
Phlegmon	18	93	70	> 0.05
No identification of the appendix	6	98	70	> 0.05
Abscess	8	93	67	> 0.05
Focal colonic wall thickening (except cecal apex area)	0	95	65	> 0.05
Segmental colonic wall thickening	2	89	62	> 0.05
Extraluminal fluid	16	80	61	> 0.05
Terminal ileal wall thickening	6	82	59	> 0.05
Lymphadenopathy	40	56	51	> 0.05
(Appendiceal) intraluminal air	20	64	51	> 0.05

* Numbers are the percentages, [†]Chi-square test or Fisher's exact test

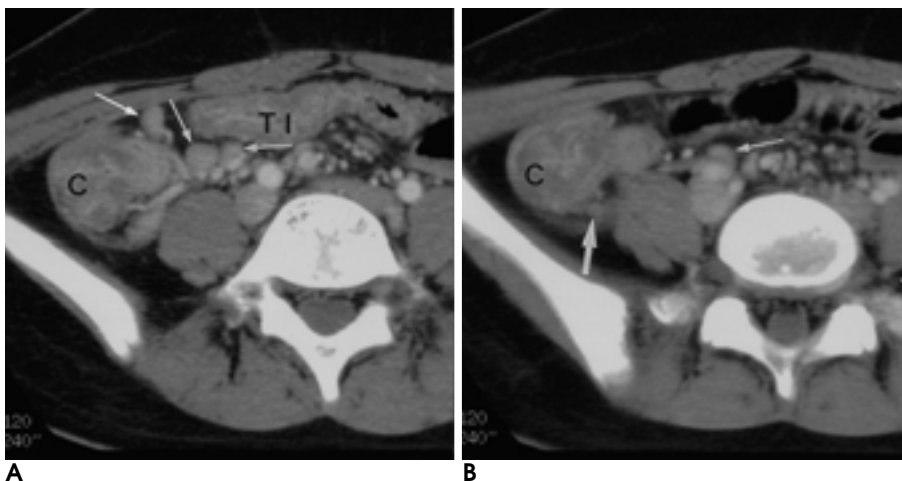


Fig. 7. Ileocolitis with mesenteric lymphadenitis in a 14-year-old woman.

A, B. Contiguous contrast-enhanced CT scans show segmental wall thickening involving the cecum (C) and terminal ileum (TI). Note multiple enlarged lymph nodes (thin arrows) and a normal appendix (thick arrow).

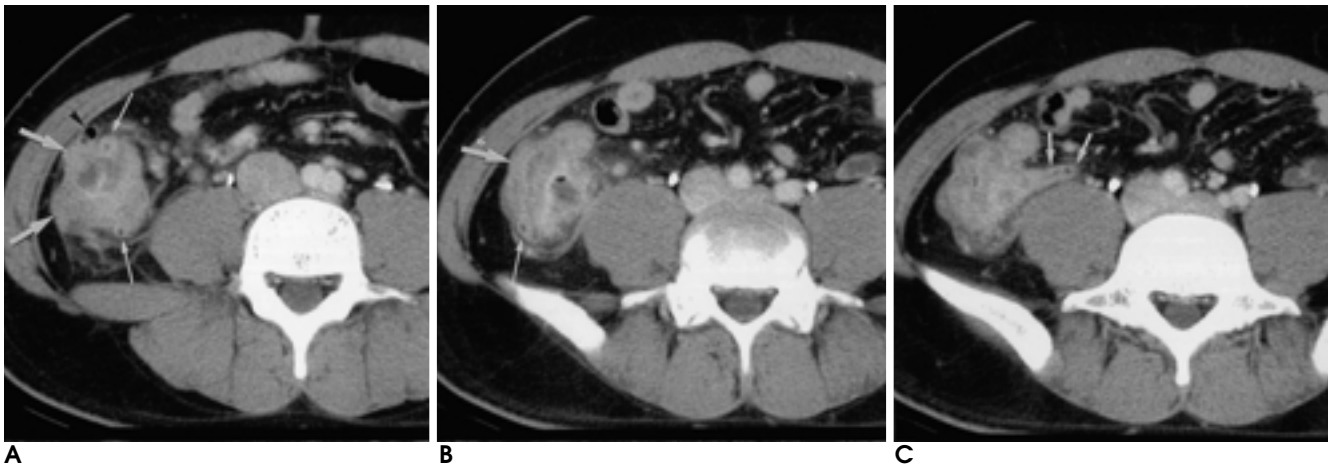


Fig. 8. Cecal diverticulitis in a 26-year-old woman.

A, B. Contrast-enhanced CT scans show three inflamed diverticula (thin arrows) and a normal diverticulum (arrowhead) at the level of the cecum. Associated segmental cecal wall thickening (thick arrows) is noted.

C. Contrast-enhanced CT scan slightly inferior to B shows a normal appendix (arrows).

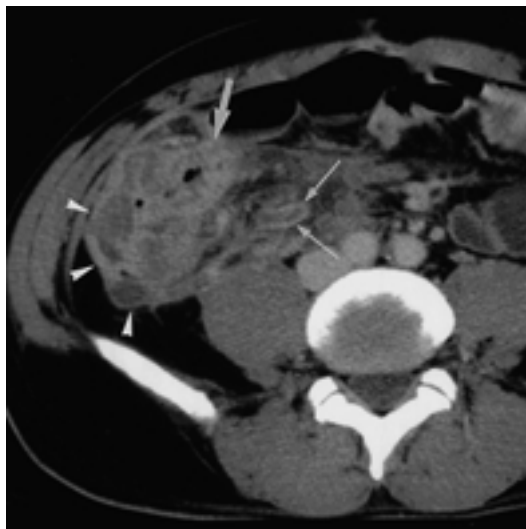


Fig. 9. Typhlitis related with severe neutropenia in a 35-year-old man. Contrast-enhanced CT scan shows segmental wall thickening involving the cecum (arrowheads) and terminal ileum (thick arrow). Mild enhancing appendix (thin arrows) and moderate inflammatory changes of adjacent mesenteric fat are seen.

2 CT
 , 1 , 1 .
 (haziness)
 (2, 6, 17). , 가
 (2). ()
 CT 78% - 100%
 (6, 7, 12, 17, 20, 23). 90%
 가 가
 가 (Fig. 5). ,
 21%
 20% (17). ,
 가
 .
 CT
 20% - 62% 가 ,
 (6, 7, 9, 17, 20, 21 - 23).
 16% CT CT
 (Fig. 3).
 (17). Lane (9)
 가 2
 . 2
 가 6 mm
 , ,

가 (21, 22, 27, 28).
 가 가
 가 (25).
 10 mm
 (9, 29).
 Rao
 CT 100%
 (6).

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Acute Appendicitis: Sensitivity, Specificity and Diagnostic Accuracy of Thin-Section Contrast-Enhanced CT Findings¹

Ji Yon Lee, M.D., Dongil Choi, M.D., Haewon Park, M.D., Young Rae Lee, M.D., Shin-Ho Kook, M.D.,
Hyon Joo Kwag, M.D., Seung Kwon Kim, M.D., Eun Chul Chung, M.D.

¹Department of Radiology, Kangbuk Samsung Hospital, Samsung Medical Center

Purpose: To assess the sensitivity, specificity, and diagnostic accuracy of individual contrast-enhanced helical CT findings of acute appendicitis.

Materials and Methods: We retrospectively reviewed the appendiceal helical CT scans, obtained after intravenous contrast administration (abdomen; 7-mm collimation, abdominopelvic junction; 5-mm collimation), of 50 patients with surgically proven acute appendicitis and 112 with alternative diagnoses. The following parameters were analysed by three radiologists: enlarged appendix (> 6 mm in diameter), appendiceal wall thickening, appendiceal wall enhancement, no identification of the appendix, appendicolith(s), (appendiceal) intraluminal air, (appendiceal) intraluminal air extraluminal air, periappendiceal fat stranding, extraluminal fluid, phlegmon, abscess, lymphadenopathy, terminal ileal wall thickening, focal cecal apical thickening, focal colonic wall thickening, and segmental colonic wall thickening.

Results: The CT findings of acute appendicitis that statistically distinguished it from alternative diagnoses were an enlarged appendix (sensitivity; 92%, specificity; 93%, diagnostic accuracy; 93%), appendiceal wall thickening (for these three parameters: 68%, 96% and 88%, respectively), periappendiceal fat stranding (90%, 79%, 82%), appendiceal wall enhancement (72%, 86%, 82%), appendicolith (16%, 100%, 74%), and focal cecal apical thickening (14%, 100%, 74%) (for each, $p < 0.05$).

Conclusion: On thin-section contrast-enhanced helical CT, an enlarged appendix and periappendiceal fat stranding were found in 90% or more patients with acute appendicitis. Appendiceal wall thickening and enhancement were clearly demonstrated and significant findings for diagnosis. Less common but specific findings include appendicolith, focal cecal apical thickening and intramural air, can also help us establish a diagnosis of acute appendicitis.

Index words : Appendicitis

Appendix, CT

Computed tomography (CT), helical technology

Address reprint requests to : Dongil Choi, M.D., Department of Radiology, Kangbuk Samsung Hospital, Samsung Medical Center, Sungkyunkwan Univ. School of Medicine, 108 Pyung-dong, Jongro-gu, Seoul 110-746, Korea.
Tel. 82-2-2001-2336, 2342 Fax. 82-2-2001-2329 E-mail: acromion@unitel.co.kr