

CT

1

2 2

CT  
 114  
 CT 가 , 가  
 : 114 57 58 CT  
 57 1 ,  
 98%, 95%, 98%, 95%, 97%  
 95%(54/57), 81%(46/57),  
 77%(44/57), 65%(37/57) 가 71%(21/29) . 20  
 1  
 CT 가

가 가 가  
 가 CT  
 CT  
 (6).  
 CT 가

가  
 CT가  
 가 (1-7). CT CT  
 2001 3 12  
 114 CT  
 76 , 38 , 45 (15-85 )  
 CT Somatom Plus - 4(Simens,  
 Erlangen, Germany)

<sup>1</sup>  
<sup>2</sup> 2001 10 22 2002 3 14 24 8 mm 90  
 5 mm 1-2

2 가  
 CT 가  
 CT ,  
 가  
 가 (tissue rim sign)가  
 가

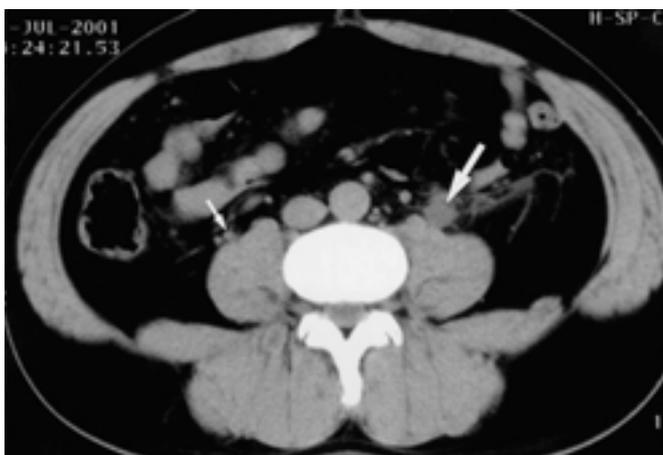
57 58 가  
 (ureteroscopic stone  
 removal) 18 , (extracorporeal lithotripsy) 8 ,  
 (percutaneous nephrolithotomy) 3  
 9 ,  
 3 , 1 , CT  
 3 . 12 ,  
 56 57 . 1 57

(8).  
 114 57 20  
 37

2 가  
 29 (Fig. 1), 13 (Fig. 2), 8 ,  
 8 (Fig. 3) . CT 1  
 4). 1 (Fig. 5).  
 CT



A



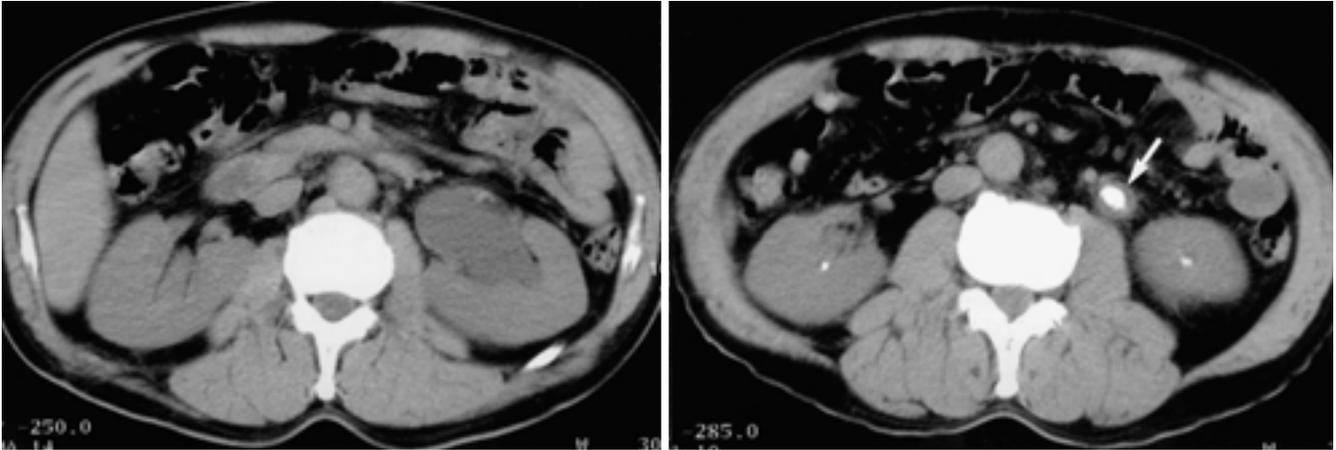
B



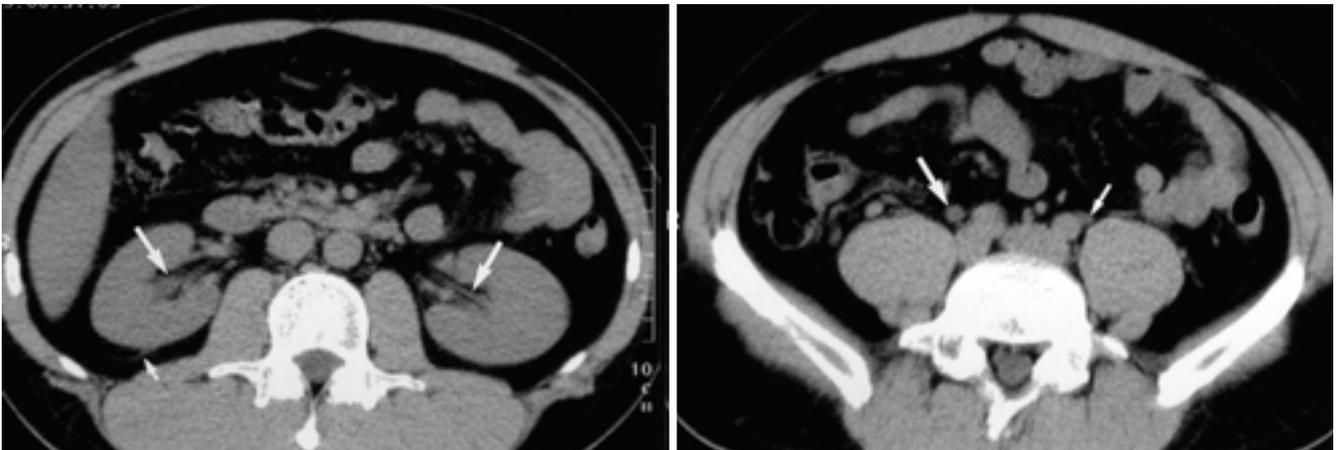
C

**Fig. 1.** A 42-year-old man with left flank pain.  
**A.** Unenhanced CT scan through the kidney shows prominent dilatation of the left collecting system compared with right. There is thickening of bridging septae and Gerota's fascia.  
**B.** Unenhanced CT scan through mid ureter shows dilatation of ureter (arrow) with periureteric infiltration and normal-sized right ureter (short arrow).  
**C.** Unenhanced CT scan through the bladder reveals 0.4cm sized stone (short arrow) at the ureterovesical junction. The stone passed spontaneously after conservative management.

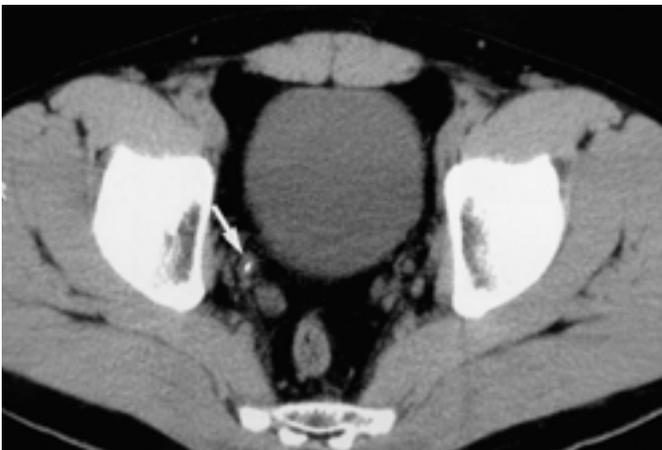
98%, 95%, 98%, 95%, 97% . 77%), 37 (37/57, 65%) 가  
54 (54/57, 95%) 29 21 (21/29,  
46 (46/57, 81%), 44 (44/57, 71%) .



**A** **B**  
**Fig. 2.** A 49-year-old man with left flank pain.  
**A.** Unenhanced CT scan through the kidney shows dilatation of the pelvocalyceal system and effacement of sinus fat.  
**B.** Unenhanced CT scan through proximal ureter demonstrates large stone with tissue rim sign (arrow). There are renal stones at the lower poles of both kidneys. The ureter stone was removed by the percutaneous nephrolithotomy.



**A** **B**



**C**

**Fig. 3.** A 33-year-old man with left flank pain.  
**A.** Unenhanced CT scan through kidney shows mild dilatation of the collecting system compared with left side (arrow). The interface between the right kidney and surrounding fat is unclear (short arrow), indicating mild stranding of the perinephric fat. In contrast, margin of left kidney is well defined.  
**B.** Unenhanced CT scan through lower ureter shows dilatation of the right ureter (arrow) and normal sized left ureter (short arrow).  
**C.** Unenhanced CT scan through the bladder reveals small ureteric calculi with tissue rim sign (arrow) proximal to ureterovesical junction. Calculi passed spontaneously.

CT

CT

(Fig. 7).

20 10  
CT

CT

CT

20

5 , 3 , 2 ,  
2 2 , 1 ,  
1 , 1 , 1 ,  
(retrocecal appendicitis) 1

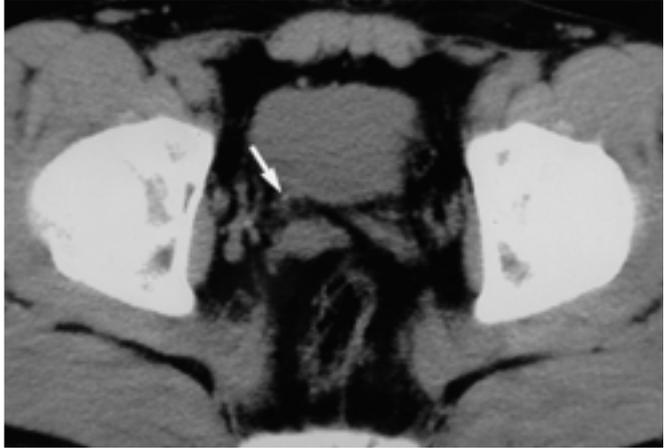
(Fig.6) 가

CT

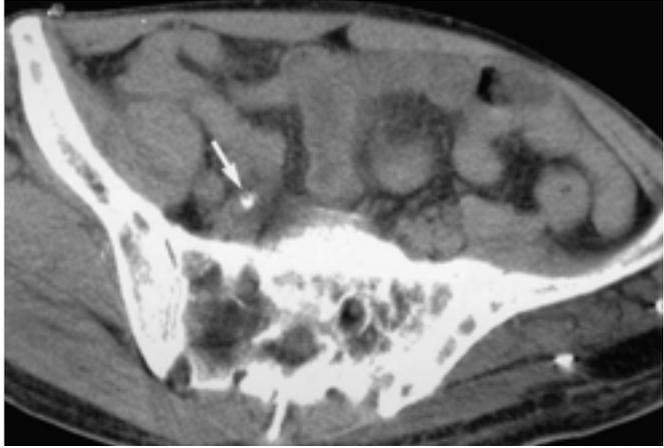
2

2

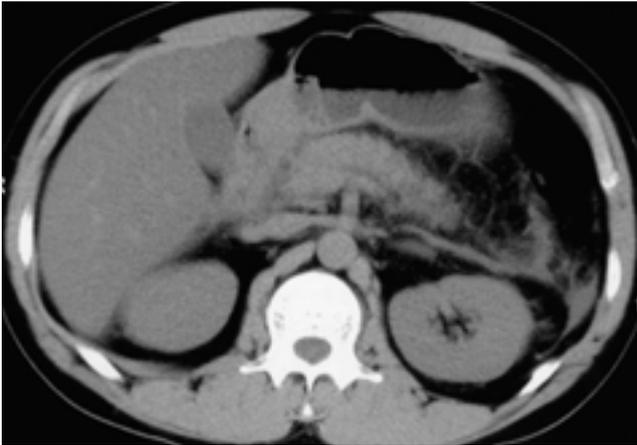
2



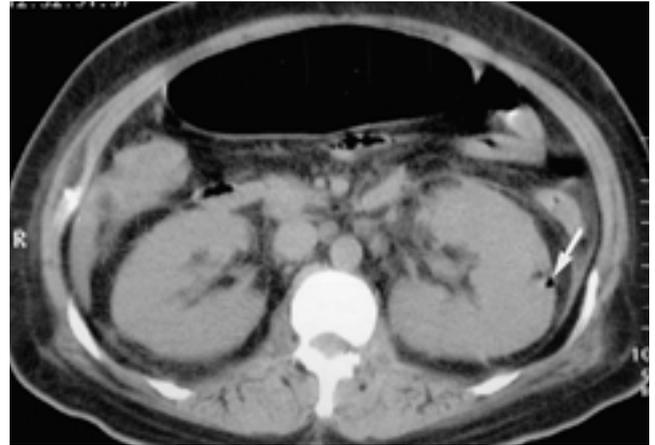
**A**  
**Fig. 4.** A 31-year-old man with right flank pain  
**A. B.** Unenhanced CT scan shows mild dilatation of renal pelvis and renal enlargement. We misdiagnosed it as pyelonephritis. In retrospect, tiny stone (arrow) is seen in the ureterovesical junction. Calculi passed spontaneously.



**A**  
**Fig. 5.** A 49-year-old man with left flank pain  
**A.** Unenhanced CT scan shows dilatation of the collecting system, perinephric infiltration, and thickened Gerota's fascia.  
**B.** Unenhanced CT scan through pelvis shows calcified lesion (arrow) medial to the iliac vessels. We diagnosed it as a ureter stone. However, the stone was not found and pyonephrosis with distal ureteral stricture was seen on ureteroscopic examination. In retrospect, the calcified lesion has a faint lucent area, indicating phlebolith.



**Fig. 6.** 31-year-old man with left flank pain. Unenhanced CT scan demonstrates severe peripancreatic infiltration with indistinct margin at the pancreatic tail. Fluid collection and thickened Gerota's fascia are seen. These findings suggest acute pancreatitis.



**Fig. 7.** 44-year-old female with left flank pain. Unenhanced CT scan through the mid portion of the kidney shows an air pocket (arrow) within swollen left kidney, suggestive of emphysematous pyelonephritis. Note thickened renal fascia and perinephric infiltration.

Author (n)	CT	Wrenn (9)	Dalrymple (7)	Smith (11)	Heneghan (8)
CT	60%	45%	90%	82%	77%
Wrenn (9)	60%			71%	92%
Dalrymple (7)	45%			99%	
Smith (11)	82%				
Heneghan (8)	77%				
CT	95-100%			95%	
Wrenn (9)	95%			81%	
Dalrymple (7)	95%			65%	
Smith (11)	95%				
Heneghan (8)	95%				
CT	98%			95%	
Wrenn (9)	98%			95%	
Dalrymple (7)	98%			95%	
Smith (11)	98%			95%	
Heneghan (8)	98%			95%	

20 10  
 CT CT 10 CT  
 CT CT  
 CT 5 3  
 (2). CT  
 CT  
 가 가 가  
 CT  
 (12, 13). 가  
 5 mm Takahashi (14) 가 가  
 (collecting system) 가 가  
 가 CT 3  
 CT  
 (15) CT  
 Lie (16) 2:1 7  
 CT  
 mm 50% - 75%  
 CT

parison of unenhanced CT and intravenous urography. *Radiology* 1995;194:789-794

2. Sommer FG, Jeffrey RB, Rubin GD, et al. Detection of ureteral calculi in patients with suspected renal colic: value of reformatted noncontrast helical CT. *AJR Am J Roentgenol* 1995;165: 509-513
3. Smith RC, Verga M, McCarthy S, Rosenfield AT. Diagnosis of acute flank pain: value of unenhanced helical CT. *AJR Am J Roentgenol* 1996;166:97-101
4. Dalrymple NC, Casford B, Raiken DP, Elsass KD, Pagan RA. Pearls and Pitfalls in the diagnosis of ureterolithiasis with unenhanced helical CT. *RadioGraphics* 2000;20:439-447
5. Sourtzis S, Thibeau JF, Damry N, Raslan A, Vandendris M, Bellemans M. Radiologic investigation of renal colic: unenhanced helical CT compared with excretory urography. *AJR Am J Roentgenol* 1999;172: 1491-1494
6. Ryu JA, Kim BH, Jeon YH, et al. Unenhanced spiral CT in acute ureteral colic: a replacement for excretory urography? *Korean J Radiol* 2001;2:14-20
7. Dalrymple NC, Verga M, Anderson KR, et al. The value of unenhanced helical computerized tomography in the management of acute flank pain. *J Urol* 1998;159:735-740
8. Heneghan JP, Dalrymple NC, Verga M, Rosenfield AT, Smith RC. Soft-tissue "rim" sign in the diagnosis of ureteral calculi with use of unenhanced helical CT. *Radiology* 1997;202:709-711
9. Wrenn K. Emergency intravenous pyelography in the setting of possible renal colic: is it indicated? *Ann Emer Med* 1995;26:304-307
10. Saita H, Matsukwa M, Fukushima H, Ohyama C, Nagata Y. Ultrasound diagnosis of ureteral stones: its usefulness with subsequent excretory urography. *J Urol* 1987;140:28-31
11. Smith RC, Verga M, Dalrymple N, McCarthy S, Rosenfield AT. Acute ureteral obstruction: value of secondary signs on helical unenhanced CT. *AJR Am J Roentgenol* 1996;167:1109-1113
12. Fielding J, Silverman SG, Samuel S, Zou KH, Loughlin KR. Unenhanced helical CT of ureteral stones: A replacement for excretory urography in planning treatment. *AJR Am J Roentgenol* 1998;171:1051-1053
13. Boulay I, Holtz P, Foley WD, White B, Begun FP. Ureteral calculi: diagnostic efficacy of helical CT and implications for treatment of patients. *AJR Am J Roentgenol* 1999;172:1485-1490
14. Takahashi N, Kawashima A, Ernst RD, et al. Ureterolithiasis: can clinical outcome be predicted with unenhanced helical CT? *Radiology* 1998;208:97-102
15. Fielding JR, Steele G, Fox LA, Heller H, Loughlin KR. Spiral computerized tomography in the evaluation of acute flank pain: a replacement for excretory urography. *J Urol* 1997;157:2071-2073
16. Liu W, Esler SJ, Kenny BJ, Goh RH, Rainbow AJ, Stevenson GW. Low-dose nonenhanced helical CT of renal colic: assessment of ureteric stone detection and measurement of effective dose equivalent. *Radiology* 2000;215:51-54

1. Smith RC, Rosenfield AT, Choe KA, et al. Acute flank pain: com-

## Usefulness of Unenhanced Helical CT in Patients with Suspected Ureteral Colic<sup>1</sup>

Bong Soo Kim, M.D., Sook Namkung, M.D., Heung Cheol Kim, M.D., Woo Chul Hwang, M.D.,  
In Sun Lee, M.D., Im Kyung Hwang, M.D., Ho Chul Kim, M.D.,  
Sang Hoon Bae, M.D., Sang Kon Lee, M.D.<sup>2</sup>, Seong Ho Lee, M.D.<sup>2</sup>

<sup>1</sup>Department of Diagnostic Radiology, College of Medicine, Hallym University

<sup>2</sup>Department of Urology, College of Medicine, Hallym University

**Purpose:** To determine the usefulness of unenhanced helical CT in patients with suspected renal colic.

**Materials and Methods:** One hundred and fourteen patients with suspected ureteral colic, referred by physicians, underwent unenhanced helical CT. Two radiologists prospectively interpreted the results, determining the presence or absence of ureter stone and other diseases that arise outside the urinary tract. In cases of ureteral stone, we retrospectively sought secondary signs of hydronephrosis, perinephric fat stranding, thickening of renal fascia, renal enlargement, and the tissue rim sign.

**Results:** Among the 114 patients, 57 were confirmed as having ureter stones. Unenhanced helical CT depicted 57 of 58 stones in 57 patients, producing one false-negative and one false-positive result. Overall, the results showed 98% sensitivity, 95% specificity, 98% positive predictive value, 95% negative predictive value, and 97% accuracy. The frequencies of secondary signs were as follows: hydronephrosis, 95% (54/57); perinephric fat stranding, 81% (46/57); thickening of renal fascia, 77% (44/57); renal enlargement, 65% (37/57); and the tissue rim sign 72% (21/29). In 20 patients, the diagnoses were not related to stone disease and included one false-negative diagnosis of pyonephrosis.

**Conclusion:** Unenhanced helical CT provides information which is valuable in the accurate diagnosis of ureteral stone as well as other diseases that arise outside the urinary tract in patients with suspected renal colic.

**Index words :** Ureter, CT

Ureter, calculi

Address reprint requests to : Bong Soo Kim, M.D., Department of Diagnostic Radiology, Hallym University, Chunchon Sacred Heart Hospital, 153 Kyo-dong, Chunchon, Kangwon-Do 200-060, Korea.  
Tel. 82-33-252-9970 Fax. 82-33-242-7085 E-mail: 67kbs@orgio.net