

가

CT

1

CT (multi - detector row CT, MDCT)
 CT (CT urography, CTU) (intravenous urography, IVU)

: 2003 1 2004 3 IVU CTU 48
 , 34 . IVU
 . CTU , 2 , 5
 , 120
 IVU CTU , , 가 ,
 CTU , 가 .
 IVU CTU , ,
 . , CTU (phase)
 : 34 27 . 15 IVU CTU
 (15/27, 55.6%), 12 CTU
 IVU (12/27, 44.5%). 7 1
 , 2 , 3 , 1 CTU 가
 . IVU 55.6% (15/27) , CTU 100% (27/27)
 , IVU CTU 100% (7/7) . IVU 100% (15/15)
 , 36.8% (7/19) . CTU
 100% (27/27, 7/7) . CTU
 (100%, 27/27), 2 19 (70.4%, 19/27), 5 8
 (29.6%, 8/27).

: CTU IVU ,
 CTU .

가 , ,
 가 MDCT 3 CT 가 .
 , MDCT 3 CTU .
 . IVU

2003 1 2004 3
 IVU CTU 48

2006 5 30 2006 9 11

. 48 6 가 , 4 2 , 5 . 5
 , 4 IVU CTU 30 가 10 120
 14 34 3
 가 (LEONARDO; Siemens Medical System,
 , Forchheim, Germany, InSpace software; Siemens Medical
 가 , 1 System, Forchheim, Germany) coronal reformed
 , 34 25 image, maximum - intensity - projection (MIP), 3
 , 9 . volume - rendering (VR)
 16 86 54 가 IVU 가 IVU CTU , ,
 16 , 18 . 34 가 8 가
 CTU ,
 . 34 (11)
 (23) . 34
 27 , 7 (1
), (2), (3), (1)
 . IVU , 7 25
 , 26 , 1
 , iopromide (Ultravist 300
 mg/mL, Schering, Seoul, Korea) 30 mL .
 CTU 16 MDCT (SOMATOM Sensation 16; Siemens
 Medical System, Forchheim, Germany) , 1.5
 mm collimation, 1.5:1 pitch, 120 kVp, 200 - 220 mAs
 5 mm .
 . iopromide (Ultravist 300 mg/mL, Schering,
 Seoul, Korea) 120 cc 3 mL/sec
 (bolus injection)

: 가 CT
 . 5
 가 10 120
 3
 (LEONARDO; Siemens Medical System,
 Forchheim, Germany, InSpace software; Siemens Medical
 System, Forchheim, Germany) coronal reformed
 image, maximum - intensity - projection (MIP), 3
 volume - rendering (VR)
 가 IVU CTU , ,
 가 CTU ,
 가 IVU
 , CTU 가
 ,

Table 1. Diagnostic Accuracy in the Detection of Urinary Stone Between CT Urography (CTU) and Intravenous Urography (IVU) (n = 34)

		CTU	
		Urinary stone (+) (n = 27)	Urinary stone (-) (n = 7)
IVU	Urinary stone (+) (n = 15)	15	0
	Urinary stone (-) (n = 19)	12	7

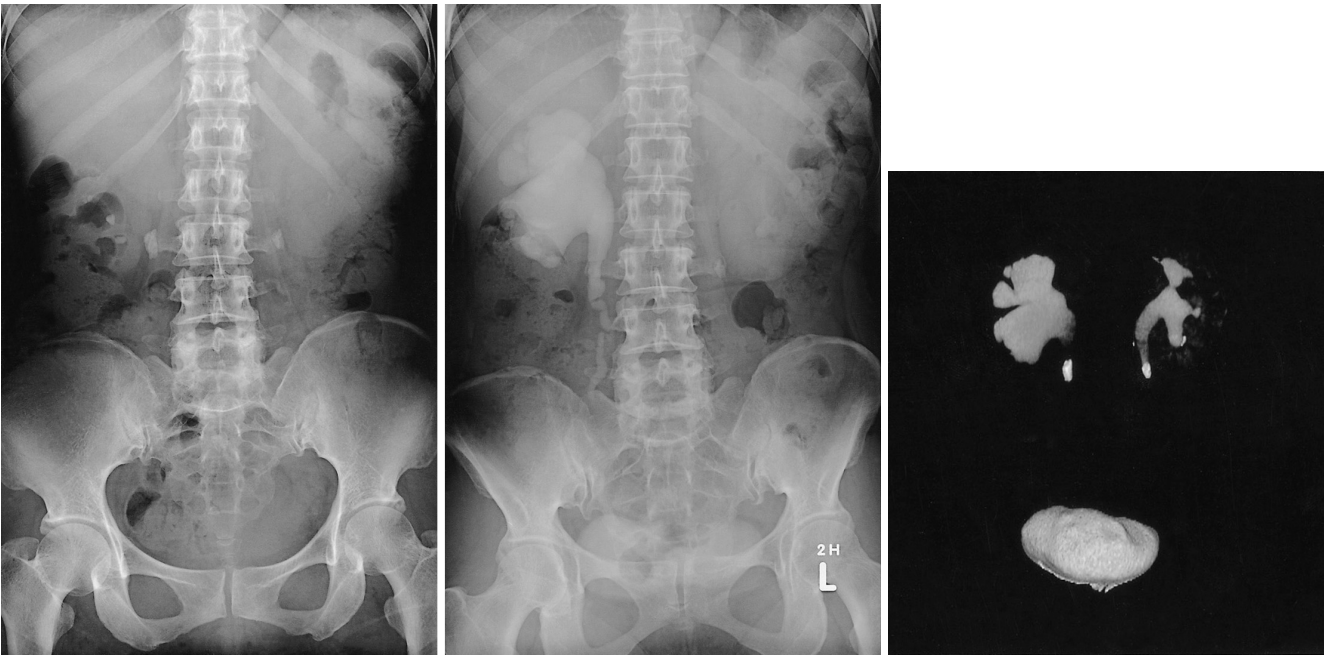


Fig. 1. Both ureter and calyceal stones: A. On KUB, two radiopaque densities are seen in the both paravertebral regions. And a few radiopacities are noted in both renal regions. B. Hydronephrosis is noted in right side and delayed excretion of contrast is noted in left side on IVU. C. On VR image at excretory phase (at 5 minutes), both hydronephroses with both ureter stones are seen. Both calyceal stones are masked by contrast.

(100%, 27/27).

CTU , , IVU 2 19 (70.4%, 19/27)
 , , 8 , 5 8
 , 27 CTU (29.6%, 8/27) , 11 ,
 , 2 5 , 120 8
 , , 가 ,
 , 가 , 7 CTU
 , 2 CTU 3 (Fig.
 3) 1
 , 1
 27 15 IVU CTU CTU
 (15/27, 55.6%) (Table 1, Fig. . IVU 6
 1). 12 CTU IVU ,
 (12/27, 44.5%). 1
 12 8 , ,
 , 3
 (Fig. 2). 1 가 IVU 가
 , (1).
 , IVU
 IVU 55.6% (15/27) ,
 CTU 100% (27/27) . IVU
 CTU 100% (7/7) . IVU 100% (15/15)
 , 36.8% (7/19) . CTU
 100% (27/27, 7/7)
 . CTU ,



A



B



C

Fig. 2. Left mid-ureter stone without hydronephrosis.

A. On IVU, there is no evidence of urinary stone or hydronephrosis.

B. On MIP image (at 2 minutes), a small ureter stone is seen in left side.

C. However, the left ureter stone is obscured on the delayed CTU.

IVU
(Fig. 3). Lang (6) IVU
CTU
가
Lang (6)
3 CTU IVU
Nawfel (7) CTU IVU
1.5
IVU 가
가
CTU
가 CTU
CTU
CTU IVU
CTU 가

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Comparison of CT Urography and Intravenous Urography in Patients with Hematuria¹

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Purpose: We wanted to compare CT urography (CTU) with using multi-detector row CT (MDCT) and intravenous urography (IVU) for diagnosing the causes of hematuria.

Materials and Methods: From January 2003 to March 2004, IVU and CTU were obtained in 48 patients. We evaluated the causes of hematuria in 34 of 48 patients. The IVU images were obtained by the conventional method. The CTU images were routinely obtained before intravenous contrast injection, and at 2 and 5 minutes after intravenous contrast injection. In case of delayed excretion of contrast by the kidneys, the delayed CT scans were obtained at 120 minutes after contrast injection. All the CT images, including the axial and 3D coronal reformatted CTUs with using software as well as conventional IVU images, were reviewed by two radiologists working in consensus. We decided if urinary stone existed or not and we looked for the indirect signs such as hydronephrosis or delayed excretion, etc. We also observed if it was possible to determine the mass, ureteral stricture and enhancement of the ureteral wall, etc. We calculated sensitivity, specificity, positive predictive value and negative predictive value for each modality to diagnose urinary stone. We compared the detection rate according to the phases of CTU.

Results: We confirmed the presence of urinary tract stones in 27 of 34 patients who had undergone both IVU and CTU. We diagnosed ureteritis in 1, transitional cell carcinoma in 5 and acute pyelonephritis in 1 of the remaining 7 patients. The urinary stones were detected in fifteen patients on both IVU and CTU (15/27, 55.6%). We detected the urinary stones on CTU, but not IVU, in twelve patients (12/27, 44.5%). The sensitivity to detect the urinary stones was 100% (27/27) on CTU and 55.6% (12/27) on IVU respectively. The specificity was 100% (7/7) on IVU and CTU, respectively. The positive predictive value was 100% (15/15) on IVU and 100% (27/27) on CTU, respectively. The negative predictive value was 36.8% (7/19) on IVU and 100% (7/7) on CTU. Precontrast CTU demonstrated the urinary stones in all 27 patients (100%, 27/27). On the other hands, urinary stones were detected in 19 patients (19/27, 70.4%) and 8 patients (8/27, 29.6%) at 2 and 5 minutes on CTU, respectively.

Conclusion: CTU is superior to IVU to diagnose the causes of hematuria such as urinary tract stone or extrarenal lesion. Precontrast CTU is the most useful modality for the detection of the urinary tract stone of the other enhanced CTUs.

Index words : Hematuria

Genitourinary system, calculi

Urography

Computed tomography (CT), comparative studies

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