

## DETECTION OF CARCINOMA IN SITU OF THE UPPER URINARY TRACT ON DYNAMIC-ENHANCED MRI: SUPERFICIAL ENHANCEMENT IN EARLY-ENHANCED PHASE IMAGES

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### <Purpose>

Carcinoma in situ (CIS) is poor prognosis disease in urinary tract. Positive urine cytology with no abnormal findings in cystoscopy, IVU, or ultrasonography, suspects CIS in the upper urinary tract. Although selective ureteral and renal pelvis washings is recommended, there is no method to localize the targeted lesion. Imaging modality also has been considered ineffective for the detection of CIS in the upper urinary tract. We prospectively evaluated whether dynamic-enhanced MR is effective in the detection of CIS in the upper urinary tract.

### <Methods>

This study was approved by the institutional review board and informed consent was obtained. The inclusion criteria was patients with positive urine cytology (class V, class IV or frequent class III) but no abnormal findings on cystoscopy and ultrasonography. From 2007 January to 2008 May, seven patients (four for initial cases and three with a history of bladder cancer) were enrolled in our study and were performed MR at 1.5 Tesla scanner (GE SIGNA Excite HD).

In addition to routine MR study including T2-weighted axial and T1-weighted axial images, dynamic-enhanced images (LAVA: liver acquisition with volume acceleration) were obtained in axial or coronal plane covering the whole urinary tract after intravenous injection of 0.15 mmol/kg of gadodiamide (Omniscan; Gadodiamide hydrate) at 4 mL/sec, followed by a 15 mL saline solution flush by using a power injector. The scan delays were 50 seconds, 90 seconds, and 180 seconds. The scanning parameters were TR/TE of 4.6/2.3; flip angle of 12°; matrix of 320x 192; section thickness of 3~4 mm, and field of view of 32~40 cm. Two radiologists prospectively assessed the existence of circumferential superficial enhancement of the upper urinary tract in the early-enhanced phase images in consensus. In patients with superficial enhancement, selective washing or targeted biopsy was performed.

### <Results>

Among 7 patients, circumferential superficial enhancement was detected in 6 patients. The diagnosis of selective washing or targeted biopsy was class V in 4 patients (two in renal pelvis, two in ureter) and was chronic inflammation in the other two (both in renal pelvis). Nephroureterectomy was performed on the four patients with class V, from which all were diagnosed as CIS. In the other one patient without finding of circumferential superficial enhancement, small papillary lesion was detected in rt renal pelvis, which was diagnosed as urothelial carcinoma after nephroureterectomy.

Follow-up MR was performed at a minimum interval of 6 months, and findings showed that the range of superficial enhancement was decreased in the two patients with chronic inflammation, and also no new abnormal findings such as superficial enhancement or papillary lesions was seen in all 7 patients.

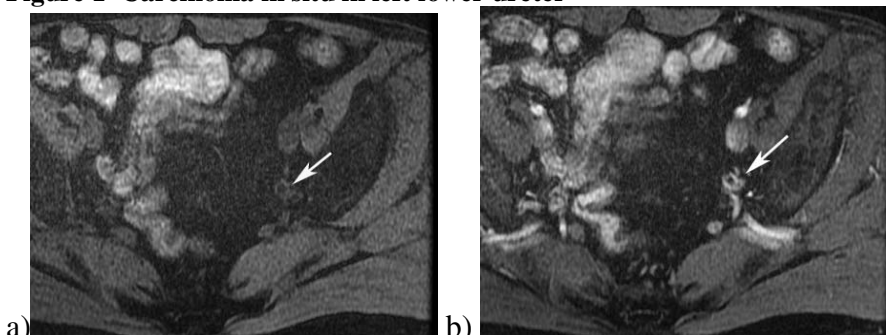
### <Discussion and Conclusion>

Recent study reported the dynamic-enhanced MR help detect small urothelial carcinoma and suggested CIS appeared as diffuse thickening and enhancement of the ureteral wall on the nephrographic phase images (1). In our study, four of six (67%) lesions with superficial enhancement were CIS. In summary, superficial enhancement of dynamic-enhanced MR is the findings of CIS, though some were chronic inflammation. For patients with positive urine cytology, superficial enhancement is useful in detecting and localizing CIS of upper urinary tract, which so far, has been unable to be evaluated.

### <Reference>

1. Takahashi N, et al. Radiology 2008; 247: 451-457

**Figure 1 Carcinoma in situ in left lower ureter**



(a) Axial precontrast three-dimensional MR image, (b) Axial early enhanced phase three-dimensional MR image. Superficial enhancement (b: arrow) was seen in early enhanced phase image.