

# Evaluation of lymph nodes in the abdomen and pelvis of the children using diffusion-weighted MR imaging.

H. Seo<sup>1</sup>, T. Masui<sup>1</sup>, M. Katayama<sup>1</sup>, K. Sato<sup>1</sup>, M. Sugiyama<sup>1</sup>, A. Nozaki<sup>2</sup>, M. Hirano<sup>2</sup>

<sup>1</sup>Seirei Hamamatsu General Hospital, Hamamatsu, Shizuoka, Japan, <sup>2</sup>General Electric Yokogawa Medical Systems, Hino, Tokyo, Japan

## Introduction:

MR imaging, which provides high tissue contrast without ionizing radiation, is commonly performed for the evaluation of the extent of the local tumor and the detection of metastases in pre/post-operative state and pre/post-chemotherapy state in the abdomen and pelvis of the children. In adults, diffusion-weighted imaging (DWI) with high b-value during free-breathing has been reported to be usefulness for the detection of lesions. Thus, the purpose of the current study was to evaluate the usefulness of DWI for recognizing lymph nodes and residual tumor in the abdomen and pelvis of the children.

## Materials and Methods:

Twenty-two patients underwent MR imaging for the evaluation of the local tumor and the metastases or follow-up MR imaging from September 2004 to August 2005, including neuroblastoma (n=9), hepatoblastoma (n=6), nephroblastoma (n=3), rhabdomyosarcoma (n=1), yolk sac tumor (n=1), neuroganglioma (n=1), mass screening positive for neuroblastoma (n=1). Total of sixty MR examinations were performed once in one patient, twice in nine patients, three times in eight patients, four times in three patients and five times in one patient. MR imaging was performed on a 1.5-T system using body array coil or head coil. Patients who didn't have their ability to cooperate with examinations were sedated with intravenous injection of thiamylal sodium. After acquiring transverse and coronal T2-weighted and T1-weighted images, transverse DWI was performed using a single-shot spin echo EPI technique under free-breathing with the following parameters: TR of 4000-8000 msec, TE of 58.5-81.7 msec, NEX of 8, b value of 1000 seconds/mm<sup>2</sup>, slice thickness 7mm, gap 0-2mm, matrix size of 128x128, with chemical shift selective fat suppression pre-pulses, with ASSET reduction factor 2 for a yield of 20 sections in about two minutes. Transverse and coronal T2-weighted images (T2WI) with/without DWI (displayed with an inverted gray-white scale) were reviewed on a PACS viewer respectively. The confidence level for the identification of lymph nodes (porta hepatis lymph nodes, paraaortic lymph nodes, mesenteric lymph nodes), suspected recurrent mass and residual tumor were classified with a five-point scale (1, not a lesion - 5 definite lesion), respectively.

## Result:

T2WI with DWI increased the diagnostic confidence level in comparison to T2WI without DWI in 31 of 42 porta hepatic (Table 1), 24 of 52 paraaortic (Table 2) and 183/356 mesenteric lymph nodes (Table 3). On T2WI with DWI the confidence level for the identification of nine lesions, which have been suspected of the recurrent mass and residual tumor in four patients, was equal to that on T2WI without DWI.

## Discussion:

MR imaging is usefulness for the detection of lesions in the abdomen and pelvis of the children. Motions artifacts generated by respiratory movement and bowel peristalsis may decrease the confidence level for the identification of lymph nodes on T2WI without DWI. DWI can provide high lesion conspicuity and combination of T2WI and DWI increase the confidence of the lesion detection.

## Conclusion:

DWI is a sensitive technique for recognizing lymph nodes in children. It might be usefulness to obtain DWI taking a few minutes in addition to the conventional MR sequences without radiation exposure and contrast material for the purpose of the detection of lymph nodes.

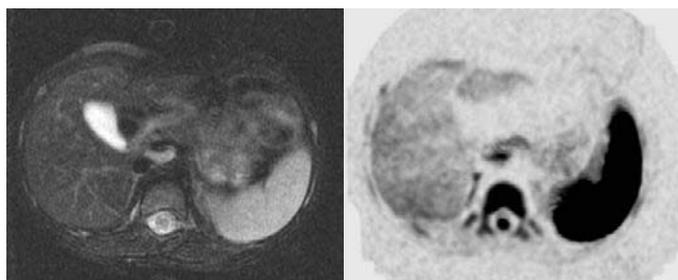


Figure 1

(a) T2WI with fat-suppression

(b) DWI

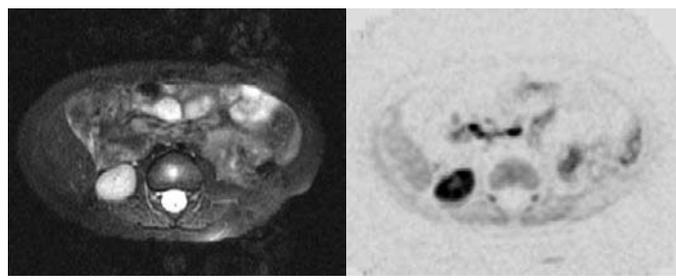


Figure 2

(a) T2WI with fat-suppression

(b) DWI

Figure 1. 5-year-old girl with left adrenal neuroblastoma detected by mass screening was untreated and followed up.

Figure 2. 1-year-old boy after surgical resection and chemotherapy for hepatoblastoma.

porta hepatis lymph nodes

		T2WI with DWI				
scale		1	2	3	4	5
T2WI without DWI	1					
	2		2	2	5	2
	3			8	11	9
	4				1	2
	5					

Table 1

paraaortic lymph nodes

		T2WI with DWI				
scale		1	2	3	4	5
T2WI without DWI	1					
	2		11	7	2	
	3			15	14	1
	4				2	
	5					

Table 2

mesenteric lymph nodes

		T2WI with DWI				
scale		1	2	3	4	5
T2WI without DWI	1			2	3	1
	2		83	13	16	1
	3			54	131	4
	4				27	12
	5					9

Table 3