

Early Gastric Cancer Diagnosis using Body Diffusion Imaging

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Patient history

55-year-old male; chief complaint was epigastralgia.

Sequence details

Respiratory triggered diffusion-weighted imaging (DWI) with PACE (Prospective Acquisition CorrEction). Axial scan, CHES pulse, TR 1400, TE 64, Bandwidth 2368, Averaging 5, GRAPPA factor 2, $b=50$ and $b=800$, FOV 500 mm, Matrix 192, slice thickness 7 mm, number of slices 32, respiratory triggering with PACE.

Results

There was no remarkable abnormality on the T1-weighted image (Fig.1), the T2-weighted image (Fig. 2) and early phase (Fig. 3) and delayed phase (Fig.4) of contrast enhanced dynamic MRI.

There was a flat membranous lesion on gastric lesser curvature with slightly high signal on low b-value DWI ($b=50$, Fig. 5) and high b-value DWI ($b=800$, Fig. 6). This finding

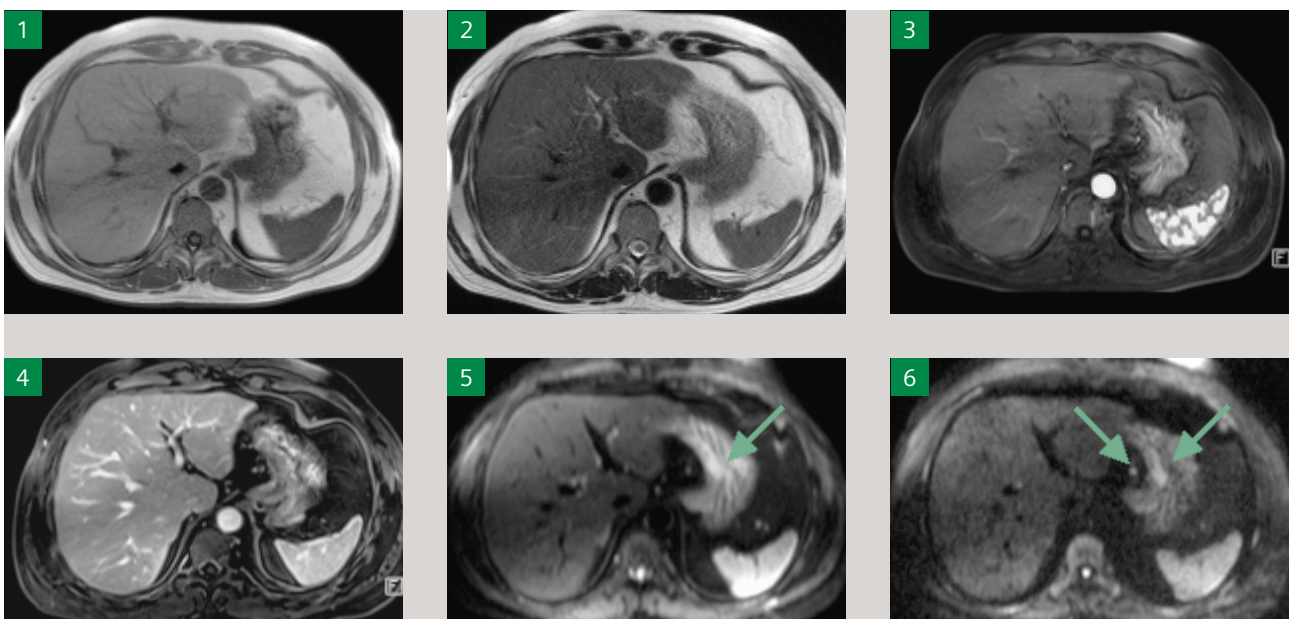
was suggestive of early gastric cancer, corresponding with endoscopic finding. Additionally, a small lymph node showed high signal on DWI, suggestive of metastasis.

Discussion

Early gastric cancer was detected with diffusion-weighted imaging (DWI). With use of antiperistalsis agents, the detectability of membranous lesion may improve on DWI.

Scanner	MAGNETOM Avanto 1.5T with SQ-engine
Coils	Body Matrix Coil, Spine Matrix Coil
Software version /add-on	syngo MR 2004V / Work-in-progress sequence*

*This information about this product is preliminary. The product is under development and not commercially available in the US and its future availability cannot be ensured.



Detection of Esophageal Cancer Using Body Diffusion Imaging

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Patient history

A 65-year-old asymptomatic man who was diagnosed with esophageal cancer of T1b stage (with invasion into the sub-mucosal layer) during a routine endoscopy examination. The patient was referred for an MR examination.

Sequence details

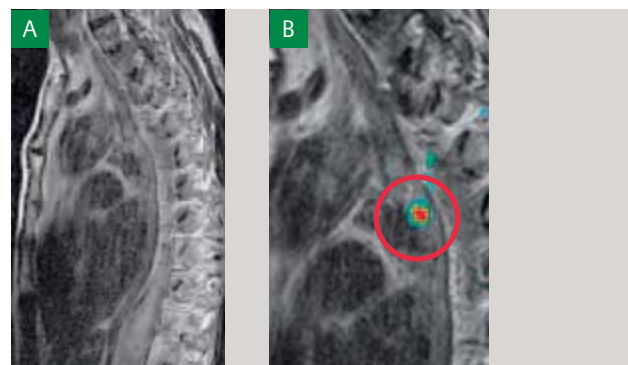
Initially, T2-weighted fast Spin Echo images were obtained for defining anatomy and localizing the tumor. The location of the esophageal tumor was estimated by rough clinical information. Following T2-weighted imaging (T2WI) with sagittal or oblique sagittal plane along the course of the esophagus, diffusion-weighted imaging (DWI) with same plane was obtained utilizing a single shot echo-planar sequence with respiratory-triggering. Parameters for DWI included TR of 4000 ms, TE of 74 ms, b factors of 0 and 500 (s/mm²), PAT factor of 2 using GRAPPA (PAT = Parallel Acquisition Technique), length of echo train (EPI factor) of 110, bandwidth of 1346 Hz/pixel, matrix of 128 x 128, and number of acquisition of 5. Both T2-weighted and diffusion-weighted images were uniformed with a section thickness of 3 mm without intersection gap, and a field of view of 350 mm.

Results

We have investigated the difference in detectability of esophageal cancer between diffusion-weighted images and T2-weighted images. Our study population included pathologically proven 13 patients with age ranging from 47 to 74 years old (mean: 62). The histologic diagnosis of the tumor was squamous cell carcinoma in all patients. The pathologic stage of esophageal cancer in 13 patients who were surgically treated were T3 (n=7), T2 (n=2) and T1b (n=4). T2-weighted images failed to demonstrate four T1b cancers, whereas fusion images with T1b and T2-weighted images failed to demonstrate only one T1b cancer.

Discussion

MRI has achieved limited clinical use in the evaluation of esophageal cancer. Reasons for this include the substantial artifacts from breathing and cardiac motion, long examina-



[A] Free-breathing T2WI with PACE (Prospective Acquisition CorrEction) hardly shows any abnormality in the esophagus.

[B] Fusion image of DWI onto T2WI shows a focal area of increased signal intensity in the upper thoracic esophagus. The lesion was confirmed to be esophageal cancer of T1b stage at surgery.

tion times, and as a result, poor imaging quality and reliability. Our study shows that DWI with respiratory-triggering can successfully demonstrate esophageal cancer as high intensity lesions in a majority of the patients. One of the big advantages of DWI over ordinary MR images is that this technique can demonstrate esophageal cancers with excellent tissue contrast, whereas T2WI demonstrates mere wall thickening of the esophagus. Even the esophageal cancers with T1b stage, which are confined within submucosal layer of the esophagus, can be demonstrated on DWI, whereas these tumors are generally hardly recognized on ordinary T2WI. The excellent tissue contrast on DWI may be explained by the difference of water diffusion between the cancer and normal esophagus. In the esophageal cancers, movement of water molecules may be restricted due to the increased cellularity and nuclear to cytoplasmic ratio.

Scanner	MAGNETOM Symphony
Coils	CP Body Array Coil, CP Spine Array Coil