

Clinical Significance of Diffusion Weighted Image in Staging Esophageal Cancer

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Purpose

The purpose is to investigate the detectability of esophageal cancer and lymph node metastases with diffusion weighted image (DWI), in comparison with surgical results.

Methods and Materials

24 patients with esophageal cancer pathologically confirmed by biopsy (20 men and 4 women; age range, 41-82 years; mean age, 64.8 years) underwent MR scanning prospectively using a 1.5-T unit and synergy surface coils enabling parallel imaging. The imaging sequence parameters of DWI were as follows: STIR-EPI, TR/TE/TI=10222/70/180msec, number of slices = 60, slice thickness/overlap = 4/1mm, volume coverage of one station = 24 cm, MPG on 3 orthogonal axes, b=1000 sec/mm², 10 averages, no respiratory trigger (DWIBS; Diffusion weighted Whole body imaging with Background body signal Suppression¹⁾). The scan was done in two stations overlapping with each other, covering the area from neck to upper abdomen. Fusion images of T2WI and DWI were created using freeware with fusion capability (OsiriX).

Three board-certified radiologists (TY, SN, and YI) performed independent and blinded evaluations in depiction of primary lesions and lymph node groups, and results were correlated with surgical results. Each lymph nodes were considered to be positive for malignancy when they were satisfied all criterion as follows: 1) the short-axis diameter >5mm, 2) long-axis diameter/ short-axis diameter >2, and 3) signal intensity of the lymph node is higher than spinal cord. Lymph nodes were classified according to guidelines for the clinical and pathologic studies on carcinoma of the esophagus, formulated by the Japanese Society of Esophagus Diseases. Fisher's exact test was used to measure inter-observer agreement. Apparent diffusion coefficient (ADC) value of the primary lesions and lymph nodes were also measured.

Results

For depiction of primary tumor, the sensitivity was 54.2%, 50.0% and 71.4% for reader A, B and C, respectively. 33 of 304 lymph node groups were pathologically diagnosed as containing metastases, while 271 lymph node groups did not contain metastases. Lymph node group-based sensitivity was 51.5%, 36.4%, 30.3% and specificity was 91.1%, 93.4%, 95.9% for reader A, B and C, respectively. Average ADC of primary tumors was 1.24 ± 0.29 mm²/sec. In lymph nodes, those were 1.45 ± 0.37 mm²/sec in metastatic group and 1.13 ± 0.24 mm²/sec in non-metastatic group. There was no statistical difference between two groups. No inter-observer differences were seen among three readers both in evaluation of primary tumor and lymph nodes (Fisher's exact test; P<0.0001).

Conclusions

Detectability of esophageal cancer and its metastases in lymph nodes were comparative to those of FDG-PET scan in literature²⁾. There were no significant differences in ADC value obtained using this method between metastatic and non-metastatic node groups.

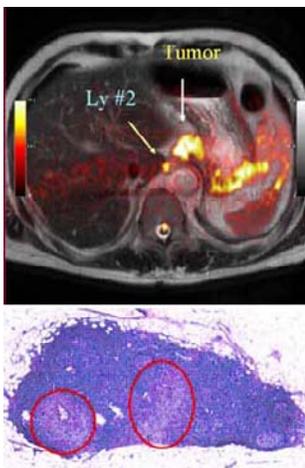
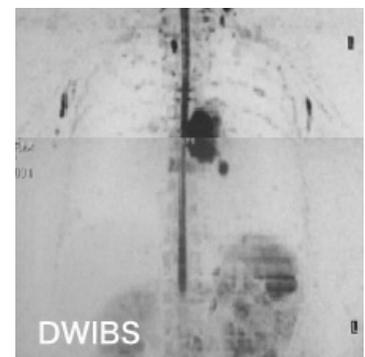


Fig.1 (Left) A 54 year old man with esophageal cancer in Ae portion. The primary lesion and group #2 lymph node are demonstrated on the fusion image. Specimen shows two cancer foci in the lymph node.

Fig.2 (Right) A 65 year old man with esophageal cancer and true metastatic lymph node. Both primary lesion and metastatic lymph node are demonstrated on MIP image of DWI. Black and white scale is inverted for so-called "virtual PET" effect.



References

- 1) Takahara T, Imai Y et al. Radiat Med. 2004; 22(4):275-82
- 2) Yoon YC et al. Radiology 2003;227(3):764-70