The ADC value in Hormone Refractory Prostate Cancers on diffusion-weighted MR images for predicting effect of chemotherapy

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PURPOSE

Recently prevailing diffusion-weighted imaging (DWI) has been applied to various kinds of solid tumors. This technique reflects tissue characteristics based on diffusion motion of water protons. In solid tumors, apparent diffusion coefficient (ADC) calculated from DWI are influenced by balances between intra- and extracellular water content, and cellularity of the tumor. In cases of rectal cancer and esophageal cancer, the ADC value of the tumor has also been reported to be useful in predicting the effect of chemotherapy. The purpose of this preliminary study is to investigate whether the ADC values of Hormone Refractory Prostate Cancer (HRPC) can predict the response to chemotherapy.

MATERIALS AND METHODS

Our study population included 13 patients with pathologically proven HRPC, who underwent 2 cycles chemotherapy (DEC therapy : Docetaxel, Carboplatin, Estramustine) and MRI for evaluation of the cancer before and after chemotherapy. All patients were undergone to biopsy after 2 cycles chemotherapy. 7 patient were pathologically effective for chemotherapy and 6 patients were pathologically non-effective for chemotherapy. The pathologically effect was evaluated by Japan urology cancer. Grade 1-2 was evaluated to non-effective, and grade 3 was effective. The age of patients ranged 68-82 years old with mean age of 76.5 years.

All studies were performed with a 1.5T superconducting system (SIGNA GE Medical System Milwaukee, WI) with TORSO coil. T1-, T2-weighted image with fat saturation and DWI were obtained. DWI data were acquired using a single-shot EPI sequence. Slice thickness was 5 mm with 0.5-mm gap, matrix size was 128 x 192, and field of view was 420 x 210 mm. BW was 110 kHz, TR / TE was 4000 / 83.7 msec, flip angle was 90 degree, averages were 8, b-value was 0 and 1000 sec/mm^2. All image interpretation sessions were performed on a workstation and the apparent diffusion coefficients (ADC maps) were displayed to the readers for DWI. ADC values were calculated from two DWI acquired with b 0 and 1000 sec/mm2. The ADC maps were reconstructed by calculating ADC values in each pixel of each slice.

Finally, the ADC value of cancer was compared between effective group and non-effective group before and after chemotherapy. The cancer area was suspected by MRI and biopsy before hormone therapy.

RESULTS

In effective group, the averaged ADC value (10-3mm2/s) of cancers before chemotherapy was 1.394 ± 0.004 and after chemotherapy was 1.263 ± 0.006. In non-effective group, that of cancers before chemotherapy was 1.053 ± 0.006 and after chemotherapy was 0.806 ± 0.009. The averaged ADC value of cancers before chemotherapy with effect group was significantly higher than those with non-effective.

CONCLUSION

The measurement of the ADC value in HRPC may be useful in predicting the effect of chemotherapy. The averaged ADC value of cancers before chemotherapy with effect group was significantly higher than those with non-effective.