

Localization of prostatic carcinoma using ADC map: correlation with stepwise section histology

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Background: The conventional role of MR imaging in the diagnosis of prostatic carcinoma (PC) has been limited to determine whether the lesion is confined to the organ, however, the need for localizing PC is increasing as less-invasive percutaneous local therapy is being introduced, including high intensity focused ultrasound or brachytherapy. Considering that PC can be multifocal involving any part of the organ, a method that covers the whole organ with acceptable spatial resolution is needed. In this regard, apparent diffusion coefficient (ADC) map is one of the promising tools.

Purpose: To elucidate the performance of ADC map in localizing PC within the gland.

Methods: Between 2000 and 2004, 93 patients underwent radical prostatectomy in our institute, 37 of whom had undergone preoperative MR imaging including ADC map. These 37 patients formed the study population in this study. MR equipment used was a 1.5T clinical unit (Siemens, Somatome Symphony) with a body phased-array coil. ADC map was generated with spin-echo type EPI, b-factors of 0,500,1000 s/mm² in three directions, 6-8mm thickness and 20% gap, 128x128 matrix, and 4 NEX. TSET2WI were obtained with TR/TE/ET/NEX=3000-4000msec/120msec/15/3, and slice thickness and gap identical to those of ADC map. The resected specimens were cut at 6-8mm thickness in a transverse plane, and each section was digitally photographed: the macroscopic areas of carcinoma were marked on the photographs of each section by one pathologist and used as a pathological map. The presence of PC was evaluated on a sextant basis (right and left bases, midglans, and apices) by two radiologists in a consensus fashion, first with T2WI alone, and then with both T2WI and ADC map. On either T2WI or ADC map, areas with apparently low signal intensity as compared to the surrounding tissue were considered to represent PC. The pathological map was also evaluated on a sextant basis and correlated to the results of MR image interpretation. Sensitivity, true sensitivity (excluding cases in which noncancerous region was checked within a certain positive sextant), and specificity were calculated and compared between the two readings.

Results: The sensitivity, true sensitivity, and specificity were 51%, 23%, and 38%, respectively, for the interpretation of T2WI alone; they were 69%, 47%, and 31%, respectively, for the interpretation of both T2WI and ADC map. The difference in sensitivity and true sensitivity were significant between the two readings (p<.05). The causes of false positivity included interstitial hyperplasia, chronic prostatitis, and hemorrhage. No definite difference was seen in the sensitivity or true sensitivity between different histological grades of PC.

Conclusion: Interpretation of both T2WI and ADC map significantly improved sensitivity of localization of PC as compared to that of T2WI alone, however, with unsatisfactory performances. Using ADC map as a guide for local percutaneous therapy, therefore, is not recommended at least at the present time.

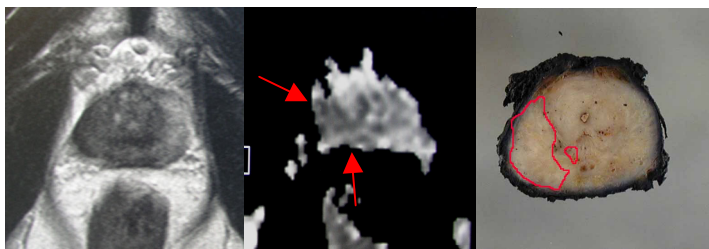


Fig.1A

Fig.1B

Fig.1C

Fig.1A T2WI. No definite focal lesion is detected.

Fig.1B ADC map. An area of low intensity (arrows) is suggested on the right side of the organ.

Fig.1C A cut surface of the specimen. An area encircled with a red line represents carcinoma, corresponding to the hypointensity area on ADC map.