Assessment of local extent of rectal carcinoma, comparison between fast-recovery T2-weighted imaging and16-detector-row CT imaging with MPVR technique

M. Katayama[1], T. Masui[1], S. Yamashita[1], N. Yoshizawa[1], H. Sakahara[2]

[1]Radiology, Seirei Hamamatsu General Hospital, Hamamatsu, Shizuoka, Japan, [2]Radiology, Hamamatsu University School of Medicine, Hamamatsu, Shizuoka, Japan

Introduction

Because of the sectional flexibility, MR imaging with T2-weighted sequence has been an important role in evaluation of local extent of rectal carcinoma as a preoperative study, while CT imaging was mainly used as a screening method for the evaluation of distant metastasis rather than local lesions. 16-detector-row CT has enabled us to obtain isotropic voxel data during breath-hold. Thus, multi-planar volume reconstruction (MPVR) imaging with high spatial resolution is easily obtained. Moreover, dynamic contrast enhancement CT reveals tumor contour clearly. The purposes of our study were to assess the local extent of rectal carcinoma between dynamic contrast-enhanced MPVR imaging using MDCT and fast-recovery T2-weighted imaging and to compare these two modalities for the abilities of the local extent of the rectal tumors.

Methods

This study included 29 patients who underwent rectal MR and CT imaging before surgery (male: 13, female: 16, age range: 32-82, mean age 66 years old). Histopathological diagnoses of all the patients were confirmed. In 18 of 29 patients, local invasion of tumor was over the rectal wall, or T3-T4. All MR and CT examinations were performed in the prone position with administration of 400-600 mL of air through inserted rectal tube. MR imaging was performed on a superconducting magnet operating at 1.5 T (Signa LX; General Electric Medical Systems, Milwaukee, WI) with a pelvic phased array coil. BreathFast recovery T2-weighted imaging was performed with the following parameters; effective TR/ effective TE/: 2000/ 86, echo train length 17, one signal acquired, matrix: 256*160, FOV: 20*20, acquisition time: 11 locations per 24 seconds. Fast-recovery pulse (sequential 180 and -90 degree radiofrequency pulse) was applied at the end of fast spin-echo sequence to recover signal intensities. Chemical-selective fat saturation technique was not applied. CT imaging was performed on 16-detector-row CT unit (LightSpeed Ultra; General Electric Medical Systems) with the following parameters: The detector configuration was 0.625 x 16 mm, in which 16 interspaced helical data sets were collected from 16 0.625-mm detector rows. The table speed was 13.75-mm. One rotation of x-ray tube was 0.8 seconds. FOV was 33 cm in diameter. These data were reconstructed to 2.5mm thickness images for routine evaluation and to 0.625 mm with the pitch of 0.3mm for MPVR images. Helical CT scanning was performed at automatically controlled tube current with a scout view (auto mA) and 120 kVp. Dynamic-contrast enhanced CT with a smart prep technique was performed with a power injector using 95mL of nonionic contrast medium, injected at a rate of 4mL / sec, imaging time of 12-18 sec. After the dynamic contrast study, a whole body scan was made for screening of distant metastasis. With all data transferred to a workstation, MPVR images were freely reconstructed by the operator. Assessment of MR and CT images (including routine transverse images and MPVR images, respectively) was made independently with a blind fashion. Evaluation of existence of penetration through the rectal wall, namely whether local staging of the rectal tumor was lesser than T3 or not, was performed with five possible confidence levels (1 = definitively absent, 2 = probably lower, 3 = possibly present, 4 = probably present, 5 = definitively present).

Results

With fast recovery T2-weighted images, sensitivity and specificity were 83.3% and 72.7%, respectively. On the other hand, with routine transverse CT images, sensitivity and specificity were 72.7% and 71.4%, respectively, while with MPVR images, sensitivity and specificity were 81% and 100%, respectively.

Discussion and Conclusion

Although T2-weighted MR imaging has high potential of diagnostic value, its spatial resolution with a pelvic phase phased array coil was inferior to CT images. In order to evaluate local extent of tumor precisely, high spatial resolution is necessary. A 16-detector-row CT study with the combination of MPVR and dynamic contrast enhancement enables to assess local invasion of the rectal tumor precisely, in addition to whole body screening .