Rectal cancer T stage: A comparative study to evaluate predictive ability of PET-CT and MR

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BACKGROUND: Rectal cancer is one of the most common digestive cancer , there were 65.5 million people worldwide each year dead for rectal cancer, colorectal cancer has become the third cancer-related death cause in the Western world. With the rapid development of medical technology, surgery has become the main treatment for rectal cancer. The different stages of treatment options based on the patient's clinical T, the patients T1 and T2 treatment option is surgery, and the patients T3, T4 cannot surgery immediately whose treatment option is neoadjuvant radiochemotherapy. 18F-FDG PET-CT and MR-DWI has been shown to be useful in staging of rectal cancer, could provide reference for clinical treatment.

HYPOTHESIS: We intended to identify the relationship between image parameters (ADC, SUVmax, length, thickness) and pathological stage, to evaluate prognostic value and accuracy of PET-CT and MR imaging stage in patients with rectal carcinoma.

METHODS: In a prospective study of 16 rectal cancer patients, proved by endoluminal biopsy performed, preoperative whole body PET-CT rectal MR imaging were performed. Two experienced physicians reviewed and interpreted the PET-CT images on a Xeleris WorkStation (GE Healthcare, Milwaukee, WI, US), measured lesions and mesorectal fat tissue SUVmax , referring to the American Joint Committee on Cancer (AJCC) and the International Union Against Cancer (UICC) TNM proposed for colorectal cancer Staging systems and related literature developed PET-CT staging of rectal cancer, MR images were interpreted on Philips MR Workspace 2.6.3.4 (Philips, Texas, US) ,a senior physicians determined whether DWI images (ROIs were sketched manually) is suitable for diagnosis and measured mean ADC valve, length, thickness, the distance of the tumor from peritoneal reflection , The distance of the tumor from the anal verge, T staging criteria established by reference to standard MERCURY. Disagreements were resolved by discussion to have a consensus interpretation. All patients underwent surgery with postoperative pathology as the gold standard of rectal cancer stage, and the imaging stage and pathological T stage (pT) comparison.

RESULTS: 16 patients histological type was adenocarcinoma, and only one patient’s pathological type was mucinous adenocarcinoma, its ADC value and SUVmax were discrepant with others, and were excluded. In 15patients whom comparisons were possible, SUVmax and ADC were 16.46 ± 8.37 and 0.97 ± 0.26, there is a negative correlation between them ($r = -0.353$, $p < 0.05$), According to the postoperative pathological stage, 5 cases were T1-2 stage, 9 cases wereT3 stage, 2 cases were T4 stage. Based on MRI and PET-CT staging, 5 cases and 4 cases were T1-T2 stage, respectively, 10cases and 11 cases were T3-4 stage, respectively. The corresponding sensitivity, accuracy, specificity was 90.9%(10/11),93.3%(14/15),90.0%(4/5) and 90.0%(9/10),86.7%(13/15),90.0%(4/5) , respectively. MR and PET-CT imaging tumor stage have a good agreement with histopathologic tumor stage (Kappa values is 0.717 and 0.643, $p < 0.05$) , the accuracy of PET-CT and MR imaging are 86.6%（13/15）. Length was irrelevant with pT ($p > 0.05$), thickness ($t = 2.898$, $p < 0.05$), SUVmax ($t = 6.028$, $p < 0.05$) and ADC value ($t = -6.432$, $p < 0.05$) were relevant with pT. The distance of the tumor from the anal verge by MRI and by colonoscopy were no statistically significant ($p>0.05$). The distance of the tumor from the peritoneal reflection by MRI and by intraoperative findings were statistically significant ($p<0.05$), this result is probably due to colonoscopy is a rigid pipe, changing the rectum of normal shape, and peritoneal reflection is a fixed structure, measurement results was accurate. In conclusion, preoperative MR imaging and PET-CT imaging correctly indicated the histopathologic tumor T stage.