The Diagnostic Accuracy of MRI in Rectal Mucinous Carcinoma

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INTRODUCTION

Mucinous carcinoma is a subtype of adenocarcinoma containing abundant extracellular mucin within the tumor (1, 2). According to the WHO criteria for mucinous carcinoma, the mucin composition should be at least 50% within the tumor for this diagnosis (1). Colorectal mucinous carcinomas tend to have been have lower curative resection rate and have an increased incidence of distant metastasis following curative resection (3). Therefore, preoperative accurate prediction of this tumor is helpful in surgical planning.

MR findings of mucinous carcinoma have been reported as characteristic high signal on T2-weighted fast spin echo images and reveals good correlation with pathology (4,5). However, there the diagnostic accuracy of MR imaging in differentiating mucinous carcinoma from rectal malignant tumors has not bee assessed in a large series.

The purpose of this study was to determine the diagnostic accuracy of MR imaging in histological typing of rectal mucinous carcinoma.

MATERIALS AND METHODS

Eighty patients (41 men and 39 women; mean 58 years old) with pathologically proven rectal malignant tumors between Jan 1998 and July 1999 were included. All underwent preoperative MRI and curative or palliative resections thereafter. Of the eighty specimens, mucin pool was found in eighteen of them, among which eleven patients had over 50% mucinous component in the tumor (mucinous carcinoma).

MRI was performed with a 1.5 T system (Horizon; General Electric Medical Systems, Milwaukee, WI, U.S.A.) using a phased-array pelvic coil. We evaluated the axial, sagittal, and/or coronal T2-weighted fast spin echo images obtained the following parameters: TR/TE 4800-7500/102 ms, field of view 20 -24 x 20 -24 cm, two signals averaged, matrix size 512×256, echo training length of 16, bandwidth of 31.3 kHz, and 5 mm section thickness with 1.5 mm gap.

Two authors independently reviewed the films in random order without knowledge of the histologic types of the tumors. The readers' confidence for the presence of mucin pool was classified by five categories: 1,definitely absent; 2, probably absent; 3, possibly present; 4, probably present; 5, definitely present. We define mucinous carcinoma as > 50% mucin pool in the tumor. The possibility of mucinous carcinoma were classified by five categories: 1,definitely nonmucinous tumor; 2, probably nonmucinous tumor; 3, possibly mucinous carcinoma; 4, probably mucinous carcinoma; 5, definitely mucinous carcinoma. The original pathologic reports were reviewed, in which adenocarcinomas were classified as tumor without mucin pool, tumor with ≥50% mucin pool and tumor with <50% mucin pool.

Receiver operating characteristic (ROC) curve analysis was performed to compare the results of interpretation of MR images versus the pathologic diagnosis. The diagnostic accuracy was determined by calculating the area under each reader-specific ROC curve (Az). Confidence level ratings of the images were also used to calculate the sensitivity, specificity for each observer in the presence of mucin pool and diagnosis of mucinous carcinoma. To determine interobserver variability in the assignment of a confidence level, weighted κ statistics were calculated to measure the degree of agreement among readers

RESULTS

The sensitivity and specificity for presence of mucin pool were 83.3% (95%CI: 58.6-96.2%) and 85.5% (95% CI: 74.2-93.1%) respectively for the reader 1, and 100.0% (95%CI: 100.0-100.0%) and 64.5% (95% CI: 51.3-76.3%) respectively for the reader 2. Diagnostic accuracy determined by Az values was 0.912 and 0.939 for the reader1 and reader 2, respectively. The interobserver agreement was good (k = 0.611).

The sensitivity and specificity for diagnosis of mucinous carcinoma were 72.7% (95%CI: 39.1-93.7%) and 89.9% (95% CI: 80.2-95.8%) respectively for the reader 1, and 100.0% (95%CI: 100.0-100.0%) and 85.5% (95% CI: 75.0-92.8%) respectively for the reader 2. The Az values were 0.911 for reader 1 and 0.937 for the reader 2. The interobserver agreement was excellent (k = 0.790).

In seven cases, false positive diagnosis was present for the both readers. Cystic degeneration or necrosis mimicked mucinous pool in six cases including two cases of previously irradiated tumor and one of rectal leiomyosarcoma. One case had rectovaginal fistula and signals from vaginal fluid have mimicked that of mucin. In seventeen cases, false positive diagnosis was present for each reader (two for reader1; fifteen for reader 2). Among them, one case had irradiated necrotic portion within the tumor and six cases were misinterpreted of surrounding intramural edema or entrapped rectal fluid.

There were no false negative results for the reader 2 and three false negative cases for the reader 1 in diagnosis of mucin pool. In these three cases, the reader 1 interpreted the mucinous pool as intramural edema or entrapped rectal fluid between rectal wall and tumor.

There were no false negative results for the reader 2 and three false negative for the reader 1 in diagnosis of mucinous carcinoma. Although both readers detected the presence of mucin in the three cases, the amount of mucin pool was underestimated by bare eye interpretation.

DISCUSSION

Our results showed that MR imaging can be accurate in detection of mucin pool and diagnosis of mucinous carcinoma in a large series, and the interobserver agreement was excellent. The finding for the diagnosis of mucinous carcinoma is the characteristic high signal intensity within the tumor on T2-wieghted fast spin echo images as previously reported (4, 5). False positive diagnosis was resulted from cystic degeneration or necrosis. In our series, this was noted in two cases of previously irradiated tumor. In these cases, comparison with images obtained before radiation therapy would be helpful to avoid false diagnosis in clinical practice. In one case of rectal leiomyosarcoma, intratumoral cystic degeneration or necrosis was difficult to differentiate with mucinous pool by signal intensity alone, but the typical bulky mass with well-circumscribed mass was suggestive of rectal submucosal tumor rather than adenocarcinoma. Small foci of mucinous pool in and entrapped fluid between the tumor and surrounding structure were also causes of misdiagnosis.

In the eighteen cases with mucin pool, sixteen cases underwent preoperative biopsy and only two cases were diagnosed to have mucin pool and one case was diagnosed as signet-ring cell type.

CONCLUSIONS

Although there are some diagnostic pitfalls in interpretation of imaging findings, MR imaging is highly sensitive in detection of mucin pool and accurate in preoperative differentiation of mucinous and nonmucinous tumors.

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