The use of magnetic resonance imaging (MRI) in preoperative planning for treatment of cancer of the rectum

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By

Abdrabbou Nagdy Abdelfattah Mashhour

Supervised by

Prof. Medhat Mahmoud Assem

Professor of general surgery

Faculty of medicine

Cairo University

Prof. Ahmed Farag Ahmed Farag

Professor of general surgery

Faculty of medicine

Cairo University

DR. Farid Gamil Amin

Lecturer of Radiodiagnosis

Faculty of medicine

Cairo University

Faculty of medicine

Cairo University

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To my wife

To my daughter

To my family

Abstract

Abstract

Background: Magnetic resonance imaging (MRI) is used for preoperative local staging in patients with rectal cancer. Our aim was to retrospectively study the effects of the imaging protocol on the staging accuracy.

Patients and methods: MRI-examinations of 26 patients with rectal carcinoma were done pre-operatively before surgical resection or neoadjuvant therapy. Rectal cancer imaging protocol was defined as including T2-weighted imaging in the sagittal and axial planes with supplementary coronal in low rectal tumors, alongside a high-resolution plane perpendicular to the rectum at the level of the primary tumor. Histopathological results were used as gold standard for comparison with the results of the MRI.

Results: Rectal imaging protocols showed significantly better correlation with histopathological results regarding assessment of rectal wall invasion, lymph nodes affection, sphincter infilteration and anterior organ involvement.

Conclusion: Appropriate MR imaging protocols enable more accurate local staging of rectal tumours with less number of sequences and without intravenous gadolinium contrast agents with determination of the methods of treatment preoperatively as radical resection either low anterior resection or abdominoperineal resection or neoadjuvant chemo-radiotherapy.

Keywords: Rectal carcinoma, Magnetic resonance imaging, total mesorectal excision.

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List of abbreviations

- ***APC:*** Adenomatous polyposis coli gene is a tumor-suppressor gene.
- ***APR:*** Abdominoperineal resection.
- ***APUD:*** Amine precursor uptake and decarboxylation.
- ***CEA:*** Carcino-embryonic antigen**.**
- ***Cm:*** Centimeter.
- ***CT:*** Computed tomography.
- ***DCC:*** Deleted in colorectal carcinoma.
- ***DNA:*** Deoxyribonucleic acid.
- ***DVT:*** Deep venous thrombosis.
- ***ERUS:*** Endorectal ultrasonography.
- ***FAP:*** Familial adenomatous polyposis.
- ***FOBT:*** Fecal occult blood testing.
- ***FSE:*** Fast spin echo.
- ***GDP:*** Guanosine diphosphate**.**
- ***GTP****:* Guanosine triphosphate.
- ***HNPCC:*** Hereditary nonpolyposis colon cancer.
- ***LOH:*** Loss of heterozygosity pathway**.**
- ***Mm:*** millimeters.
- ***MRI:*** Magnetic resonance imaging.
- ***p53:*** Tumour suppressor gene.
- ***PET:*** Positron emission tomography scans.
- ***PME:*** Partial mesorectal excision.

- ***Ras:*** Protooncogen.
- ***SILS***: Single incision laparoscopic surgery.
- ***SNR:*** Signal-to-noise ratio.
- ***Tis:*** Carcinoma in situ.
- ***TME:*** Total mesorectal excision.
- ***TNM:*** Tumour, nodes and metastasis.
- ***TSE:*** Turbo spin echo.

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Introduction

Introduction

Colorectal carcinomas are the most common gastrointestinal tract tumors. 50-60% of colorectal carcinomas originate in rectum and sigmoid colon ***(Elmas et al, 2002).***

Colorectal carcinoma is a frequent disease. New and improved surgical techniques and the implementation of adjuvant and neoadjuvant therapy have improved the 5 year survival rate significantly. Accurate preoperative assessment of tumor extent is essential for choosing the appropriate therapeutic strategy, and thus for patient prognosis ***(Kjellmo and Drolsum, 2007).***

High resolution MRI of the rectum allows preoperative identification of important surgical and pathological prognostic factors. This may allow both better selection and assessment of patient undergoing preoperative therapy ***(Brown et al, 2003).***

MRI can accurately stage and help surgeons plan sphincter saving surgery in patient with rectal cancer. High resolution MRI is highly accurate in predicting tumour infiltration in surrounding structures for locally advanced primary or recurrent rectal cancer and is recommended in the preoperative work up of these tumours ***(Beets et al, 2008).***

MRI has been used increasingly because of its benefits of pelvic imaging and gives more information for preoperative staging status than any other diagnostic method. It can show a clear relationship between rectal cancer and any adjacent pelvic organ. It can also show a lateral pelvic lymph node status and any involvement of levator ani muscle beyond the reach of transrectal ultrasonography**.** MRI also has been known to be able to provide surgeons with valuable information regarding the presence of sphincter invasion and the surrounding structures in patients with distal rectal cancer which is important for making a decision on whether to perform sphincter preservation or not ***(Nam Kyu et al, 2000).***

MRI showed a good comparable accuracy rate for determining depth of tumor invasion, compared with transrectal ultrasonography which has a low accuracy rate for detecting metastatic lymph node ***(Hunerbein et al, 2000).***

Aim of the work

The aim of the work

To assess the accuracy and the role of CT in preoperative staging as in some centers in Egypt it considered as the investigation of choice. Also to determine the accuracy of MRI in preoperative staging of rectal carcinoma in relation to intraoperative assessment and histopathological examination as the gold slandered tool. Assessment of the MRI role in pre and post neoadjuvant carcinoma of the rectum is an important goal. Determination of the complete response of rectal carcinoma to neoadjuvant chemotherapy and role of the MRI in its diagnosis. Methods of management of patients with complete response detected by MRI. The role of preoperative (MRI) in the evaluation of pathological prognostics that influence local recurrence and survival in rectal cancer includes, The tumour (T), Nodal (N) staging, Depth of extramural tumour spread, The presence or absence of extramural lympho-venous invasion. A threatened circumferential resection margin and serosal involvement.