ABENHA MEDICAL JOURNAL bmj

Print ISSN 1110-208X

Online ISSN 2357-0016

Original article

The Role of MR Imaging in Local Staging and Assessment of Sphincteral Invasion in Rectal Carcinoma

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Received: 19 June 2022

Accepted: 15 August 2022

Abstract

Background: Cancer rectum is one of the most common causes of cancer all over the world. Early diagnosis depends on presenting symptoms and screening followed by diagnostic studies; the most widely used are colonoscopy and barium enema. Recently, the MRI examination of the rectum has evolved as the standard technique in the assessment of cancer rectum having multiplanar capabilities and high tissue contrast imaging. **Aim:** The purpose of this study was to examine all patients with rectal tumors regardless of size, level within the rectum, or degree of stenosis. **Methods:** Sixty patients with primary rectal cancer were studied .the age range was 20 to 65 years with the mean age 40 years .Female to male ratio was three to two . The diagnosis of rectal carcinoma in these patients was established based on their symptomatology, clinical examination, proctoscopy and biopsy. The lesions were located 3-12 cm from the anal verge .patients were selected from outpatients clinic and department of surgery at the National Cancer Institute, Cairo University. **Results:** MRI was proved to have high accuracy in the assessment of the rectal wall infiltration and pelvic organ involvement which is about 97.9 %. And also has high accuracy in the assessment of perirectal and pelvic lymph nodes involvement which is about 94.6 % as compared to the post-operative pathological results. **Conclusion**: Preoperative MRI has a golden standard value in the establishment of the best treatment strategy.

Keywords: MR imaging; local staging; sphincteral invasion; rectal carcinoma

Introduction

Rectal cancer is one of the most common tumors in industrialized countries and one of the most common malignant tumors of the gastrointestinal tract**.** Rectal cancer has a highly variable outcome, with local pelvic recurrence after surgical resection usually leading to incurable disease. The success of tumor excision depends largely upon accurate tumor staging and appropriate surgical technique ***(1)*****.**

High-resolution MRI is moderately accurate in prediction of tumor stage in patients with rectal cancer who have undergone long-course preoperative chemo-radiotherapy. The surgically more relevant parameter is the distance between tumor and circumferential resection margin can be predicted to a few millimeters [(2)].

High-resolution magnetic resonance (MR) imaging plays a pivotal role in the pretreatment assessment of primary rectal cancer as it also improve the assessment of nodal morphology, particularly for superior rectal and pelvic side wall nodes, and of the relationship between advanced-stage tumors and adjacent pelvic structures. Diffusion-weighted MR imaging is a useful tool for

monitoring rectal cancer response after chemotherapy with the use of apparent diffusion coefficient values in combination with other MR imaging criteria significantly improves discrimination between malignant and benign lymph nodes [***(3)***].

High-spatial-resolution MR imaging has an important role in the accurate assessment of the distance between the lower margin of the rectal cancer to the point at which the levator ani muscle attached to the rectum as a criterion for predicting the feasibility of sphincter sparing surgery and it also can assess the infiltration of the internal and external anal sphincter and the feasibility of internal sphincter resection with prolapsing technique to save at least the external sphincter and the anus although the distance was only about 1.5 cm [***(4)***].

Although the results of recent surgical trials indicate that evaluation of the involvement of the mesorectal fat and mesorectal fascia is even more important than T staging for treatment planning, magnetic resonance (MR) imaging is increasingly being used to evaluate tumor respectability in rectal cancer patients and to determine which patients can be treated with surgery alone and which will require radiation therapy to promote tumor regression [***(5)***].

Traditionally, surgeons have evaluated rectal cancer patients using digital examination, endorectal ultrasonography and in some cases computed tomography. These methods do not provide the information necessary concerning the relation of the tumor with the circumferential resection margin, which we can access today through high-resolution MRI. As principal benefits, adequate staging by high-resolution MRI avoids unnecessary preoperative treatments, provides an objective staging system for future clinical trials and allows the selection of the best possible preoperative therapy needed for the patients [***(6)***].

Although susceptibility artifacts from bowel gas increase at higher field strength, Most of recent MRI studies have been performed with high field strength of 1.5 T or more .because this artifact can be reduced with the use of the spine echo sequences and distention of the rectum with warm gel [***(7)***].

Phased-array surface coil MR imaging in particular plays a vital role in the therapeutic management of rectal cancer. At present phased-array MR imaging best fulfills the

clinical requirements for preoperative staging of rectal cancer [8].

This study aimed at assessment of the role of MRI in the diagnosis, and staging of cancer rectum and planning of sphincter sparing surgery.

Patients and methods

This was a prospective study that was conducted at El Orman Oncology hospital from 2021.

Sixty patients with primary rectal cancer were studied .the age range was 20 to 65 years with the mean age 40 years .Female to male ratio was three to two .

The research ethics committee (Faculty of medicine-Benha University) approved the study protocol, and all patients were enrolled after written informed consent was obtained. Patients were recruited from Radiodiagnosis, and from Nuclear medicine departments Written informed consent was obtained from all participants.

The diagnosis of rectal carcinoma in these patients was established based on their symptomatology, clinical examination, proctoscopy and biopsy. The lesions were located 3-12 cm from the anal verge .patients were selected from outpatients clinic and department of surgery at the National Cancer Institute, Cairo University.

- **Inclusion criteria:-**

Patients diagnosed with rectal cancer.

- **Exclusion criteria:-**

Patient who has one or more of the absolute or relative MRI contraindications i.e. patient with one or more of the following:-

1- Electronic, magnetic and mechanically activated implants.

2- Ferromagnetic or electronically operated active devices like automatic cardioverter defibrillators and cardiac pacemakers.

3- Metallic splinters in the eye.

4- Ferromagnetic haemostatic clips in the central nervous system (CNS).

5- Cochlear implants.

6- Insulin pumps and nerve stimulators.

7- Lead wires or similar wires.

8- Prosthetic heart valves (in high fields, if dehiscence is suspected).

The patients were subjected to the following:

1-Detailed history with special emphasis on:

History of present illness suggestive of cancer rectum e.g. presence of constipation and/or fresh blood in stool.

2-Clinical examination:

General clinical examination.

Local examination: location, size and predicted degree of infiltration of the lesion .

3-Routine laboratory evaluation:

Complete blood picture, liver function tests, prothrombin time and concentration and stool analysis for occult blood.

4-Barium enema:

Double contrast barium enema using suitable barium suspension, barium is allowed to run as far as splenic flexure then air was insufflated with Higginson’s syringe .This was performed for some selected

patients to rule out any synchronous colonic neoplastic lesions or large polyps.

5-Real time abdominal and pelvic ultrasonography:

All patients were subjected to abdominal and pelvic ultrasonography .Evaluation was made to exclude metastatic disease and pelvic regional lymphadenopathy.

6-Magnetic resonance imaging:

All patients were proved cancer rectum were subjected to pelvic MRI examination performed on 1.5T magnet (Philips) with pelvic phased array coil.

7- Follow up:

The lesions in all selected cases were surgically resected .Operative data and postoperative pathological staging were compared to the MRI staging.

Magnetic resonance imaging

Instruments:

1- MRI machine

MRI scan was performed on a 1.5 magnet (Philips).

2-Pelvic phased array coil:

The pelvic phased array is received only surface coil which consist of two sections .The bottom section is stationary and the top section is movable.

Technique of examination

Preparation before the examination:

The aim of the patient preparation is to familiarize the patient with the procedure ,to make the procedure as comfortable as possible and to stress the importance of minimizing the motion.

The patient was advised to have an enema 1-2 hour prior to the examination so that an excess amount of rectal faeces would not be present.

The patient lies in the lateral decubitus and Folly's catheter was inserted and luminal distention by warm gel about 150-200ml.

The examination:

- The patient return to the supine position on the examination couch. Entering the feet first.
- The pelvic phased array coil is connected and composed of two sections. The upper section of the pelvic array coil is brought up between the patient's leg and visually centered over the lower section of the array. Both sections are marked with align of the marks on both coils.
- Ear blugs applied for the patient after all instruction has been given.
- When the patient is positioned comfortably, the array is secured with straps provided. In addition to holding the arrays sections together, these straps help minimize patient motion artifacts.
- Application of immobilization foam pads.
- 20 ml Buscopan was administrated intravenously for control of peristalsis.
- Sagittal scout images are obtained parallel to the coil.

- A minimum of three pulse sequences (axial T1, T2 and coronal T1 weighted images) were performed in all patients.
- The basic sequence protocols for MR imaging of the rectum have yet to be standardized. Use of both T1 and T2-weighted sequences with acquisition of contrast material–enhanced images is mandatory. A minimum of three pulse sequences (axial T1, T2 and coronal T1 weighted images) were performed in all patients .High-resolution T2-weighted imaging has been used in most studies, with images being obtained with a non-breath-hold turbo spin-echo sequence. This sequence features noted at table 1a.

Images are usually acquired in the axial, coronal, and sagittal planes to better depict the length of the tumor and all three of its spatial dimensions. The use of fat-suppressed T2-weighted MR imaging has been advocated to improve visualization of tumor spread into the perirectal fat. Although volume imaging with a short repetition time and short echo time can provide high spatial- resolution images, the images do not allow differentiation between the tumors and the bowel wall layers due to their similar signal intensities.

After the examination:

- The coil is disconnected from the MR machine.

Histopathological study:

- All cases were operated upon and their post-operative specimens were submitted to the department of pathology.
- Specimens were fixed in 10% formalin 24 hours before dissections.
- Full gross description of the specimen was made namely a) tumor size and evidence of sub mucosal tumor extension b) tumor site and distance of its lower level from the ano-rectal junction (levator ani insertion site) c) adjacent mucosa for evidence of tumor multiplicity or evidence of any associated polypi or ulcerative colitis.
- Multiple horizontal sections through the tumor were made, including the deep line of excision to identify the block containing the deepest point of penetration by the tumor.
- Areas suspicious for serosal penetration were sampled for histology. All lymph nodes with the fat deep to the tumor were removed. Tissue sections were fixed in 10%neutral of buffered formalin for 24 hours and paraffin blocks were prepared. Five micron thick sections stained with Hematoxylin and Eosin.
- Histopathologic study for all tissue sections was made including histopathologic type and grade according to WHO classification.

Statistical methods

The collected data is revised, coded, tabulated using Statistical package for Social Science (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Data are presented and suitable analysis is done according to the type of data obtained for each parameter.

Kolmogorov Smirnov test was used to test the normality of data distribution. The parametric numerical data were expressed in the form of mean, standard deviation (mean ± SD), while the non-parametric numerical data were expressed by median and range. Frequency and percentage were reported for non-numerical data .

Differences between groups were tested using Student T Test between two study group means, while for a non-parametric variables; Mann Whitney Test (U test) was used between two study groups.

A p value was considered significant if <0.05 at confidence interval 95%.

Results

This study include 60 patients pathologically proven rectal carcinoma (56 cases were diagnosed pathologically as adenocarcinoma and 4 cases as melanoma). the 56 cases of adenocarcinoma shows different pathological types in the form of 37 patients was mucinous adenocarcinoma , 2cases was adenocarcinoma with neuroendocrinal differentiation ,12 cases was signet ring adenocarcinoma and single case was spindle cell type as well as the other 4 cases was undifferentiated type **Table (1).**

In two cases the tumor was located in the upper third of the rectum "12-16 cm from the anal verge " ,in 11 cases ,the lesion was located in the middle third "8-11cm from the anal verge" and in 23 cases ,it was located at the lower 1/3 of the rectum and in 21 cases it was seen involving the whole rectal length as well as in 3 cases involve the anal canal alone **Table (2)**.

In 60 patients, the whole tumor extension was examined using the pelvic phased array coil with trans rectal gel administration. Gadopentate dimeglumine contrast media (magnevist) was intravenously administrated using a dose of 0.1mmole per kilogram of body weight in all patients examined. Contrast enhancement was noted in all cases presenting different pattern ranging between homogenous and heterogeneous pattern of enhancement .The tumor tissue appears more enhanced than the rectal wall muscle layers and less enhanced than the mucosal layer.

The interpretation of the MR images was facilitated using the five layer anatomic model.

No lesion was staged as T1 by MRI i.e. no lesion was confined to the mucosal layer of the rectal wall in our patients.

In 15 cases, the rectal lesion was staged as T2, there was invasion of the rectal layer up to the muscularis properia with no penetration of the muscularis properia or perirectal fate .Histopathological examination coincide with MR finding confirming that there was no perirectal fat infiltration .

Thirty three lesions diagnosed as T3, there was invasion of all rectal layers with perirectal fat infiltration yet without pelvic organ involvement .This was confirmed by histopathological assessment in thirty one cases while one lesion was proved to has infiltration of the peritoneal fold (T4A) and the last case was confined to the muscularis properia (T2) with no evidence of perirectal fat infiltration.

Twelve lesions were diagnosed as T4. One case shows seminal vesicles, urinary bladder as well as peritoneal fold invasion, 2cases show posterior vaginal wall invasion and nine cases show peritoneal fold infiltration. This was confirmed by histopathological assessment in eleven cases. The other lesion was staged as T3 instead of T4a **Table 3**.

MRI assessment of pelvic lymph nodes in comparison with histopathological results was true positive in 43 cases, true negative in 14 cases, false positive in 2 cases and false negative in 1 case. The sensitivity of the detection of lymph nodes involvement is 97.73% with 87.50% specificity .positive predictive value was 46.49% and negative predictive value was 99.71% as well as the accuracy reach to about 88.52% **Table 4**.

The diffusion sequence has important value in detection of the lymph nodes and helping in differentiation between benign and malignant lymph nodes. The metastatic lymph nodes show restricted diffusion pattern (high signal at different B values) with low ADC values. Receiver operator characteristic (ROC) analysis was used to determine the optimum cut off value of ADC in diagnosing nodal involvement .The study revealed the cut off value of ADC is 1.007, the sensitivity and specificity reach to 100% **Fig.1**.

Case presentation

Case 1:

Clinical history:-

30 years old female patient presented by constipation.

Technique:-

Pelvic phased array coil with rectal gel administration

Sequences:-

- Axial T1, T2 Wis
- Axial T2 and ADC
- Coronal and sagittal T2

Finding:-

(a,b) Axial T2 and T1 c,d) Axial T2 and ADC and (e,f) Coronal and sagittal T2 WIs for a known case of rectal carcinoma showing irregular mural wall thickening with stricture form is seen infiltrating the submucosa and the muscularis properia and showing focal extraserosal extension of the proximal half of the rectum (arrow head in a) measuring about 16 mm max thickness and 6.8 cm length . It is seen extending to the mesorectal fascia anteriorly (arrow in a) .also it is seen reaching and retracting the peritoneal reflection (arrow in c and f). It is seen extending about 6.1 cm from the levator insertion site at the anal canal (e). Few small perirectal lymph nodes (about 3 in numbers noted at arrow of b) and showing restricted diffusion at d with low ADC value about 0.83 suggestive of being metastatic

MRI staging:-

T4aN1

Surgery:

Anterior perineal resection with infracolic omentectomy.

Post-operative pathological staging:-

T4aN1

Pathological diagnosis:

Mucinous adenocarcinoma grade II. (Figure 2)

Case 2:

Clinical history:-

63 years old male patient presented by bleeding by rectum.

Technique:-

Pelvic phased array coil with rectal gel administration

Sequences:-

Axial T1,T2 Wis

Coronal and sagittal T2 Wis

Post contrast axial and coronal T1 fat sat. Wis

Finding:-

(A,b) Coronal and axial T2 Wis before rectal gel administration for known case of cancer rectum show less accurate assessment of the involved site of the rectum due lack of proper distention .

(C,d,e) Coronal T2, axial T1 and T2 Wis after trans-rectal gel administration show irregular mural wall thickening seen infiltrating the submucosa and extending to the muscularis properia of the lower 1/3 of the rectum and anorectal junction with no extra serosal extension and Intact mesorectal fate and fascia , It is seen extending about 4.5 cm from the anal verge . It is seen associated with small perirectal lymph nodes (about 2 in number) are noted showing restricted diffusion.

MRI staging:-

T2N1

Surgery: Abdominoperineal resection

Post-operative pathological staging:-

T2N1

Pathological diagnosis:

Mucinous adenocarcinoma (Figure 3)

Table (1): Number of the lesions and percentage of different pathological lesions.

Pathological type	Frequency	Percent
Amelanotic melanoma	4	6.67
Mucinous adenocarcinoma	37	61.67
Adenocarcinoma with Neuroendocrinal diff.	2	3.33
Signet ring adenocarcinoma	12	20.0
Spindle cell type	1	1.67
Undifferentiated type	4	6.67
Total	60	100.0

Table (2): Location of the rectal lesions and the number of cases at the affected site.

Tumor location	No. of cases
Upper third of the rectum"12-16cm from the anal verge"	2
Middle 1/3 of the rectum"8-11cm from the anal verge"	11
lower 1/3 of the rectum"4-7cm from the anal verge"	23
Whole rectal length	21
Anal canal alone	3

Table 3: Staging by MRI and histopathological results .Bold figures indicate agreement

MR	Histopathology					Total
	T0	T1	T2	T3	T4	
T0	-	-	-			
T1	-	-	-			
T2	-	-	15			15
T3	-	-	1	31	1	33
T4	-	-		1	11	12
Total			16	32	12	60

Table 4: Sensitivity, specificity,(+) ve PV , (-)ve PV and accuracy of assessment of lymph node involvement in comparison to pathological results.

Sensitivity	**Specificity**	**(+)ve PV**	**(-)ve PV**	**Accuracy**
97.73%	87.50%	46.49%	99.71%	88.52%

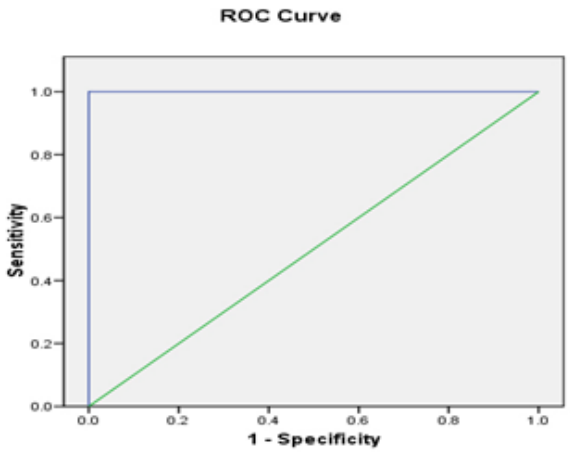

Fig.1 Receiver operator characteristic (ROC) analysis

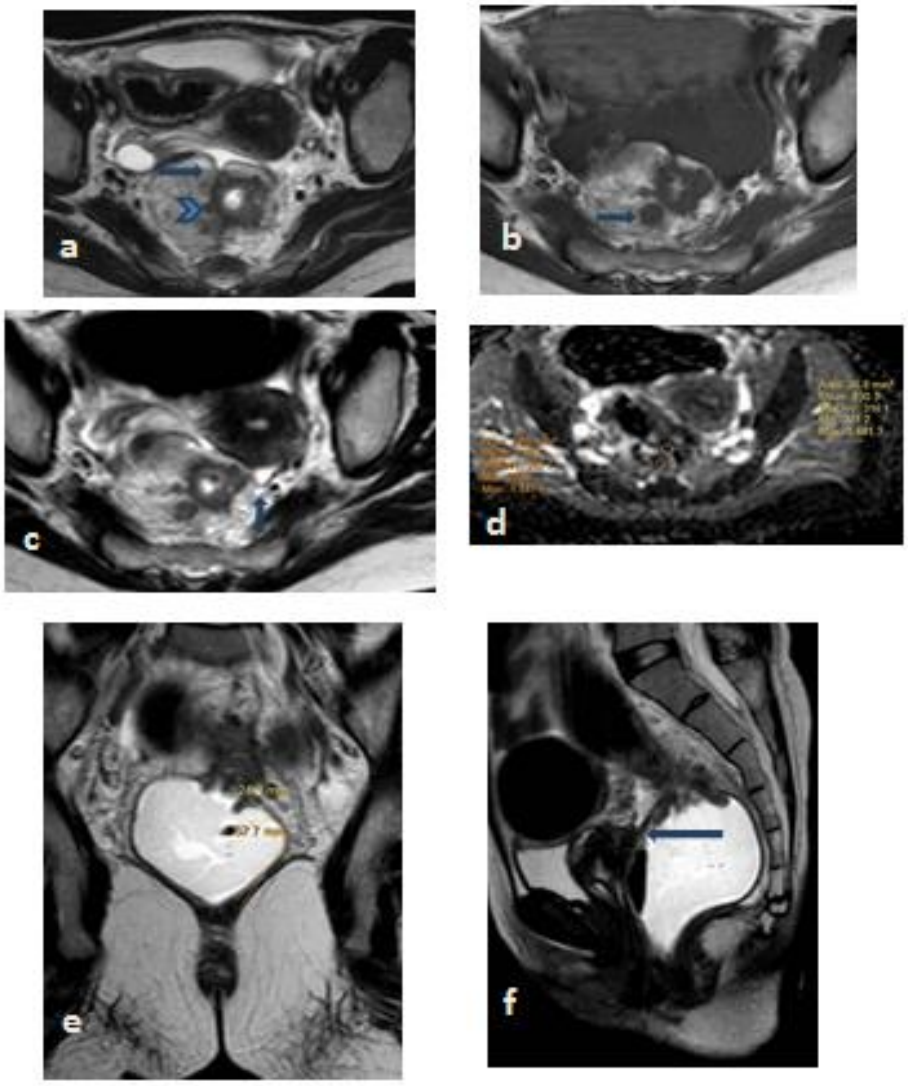

Fig. 2 a,b) Axial T2 and T1 c,d) Axial T2 and ADC and e,f) Coronal and sagittal T2 WIs for a known case of rectal carcinoma showing irregular mural wall thickening with stricture form is seen infiltrating the submucosa and the muscularis properia and showing focal extraserosal extension of the proximal half of the rectum (arrow head in a) measuring about 16 mm max thickness and 6.8 cm length . It is seen extending to the mesorectal fascia anteriorly (arrow in a) .also it is seen reaching and retracting the peritoneal reflection (arrow in c and f). It is seen extending about 6.1 cm from the levator insertion site at the anal canal (e). Few small perirectal lymph nodes (about 3 in number noted at arrow of b) and showing restricted diffusion at d with low ADC value about 0.83 suggestive of being metastatic

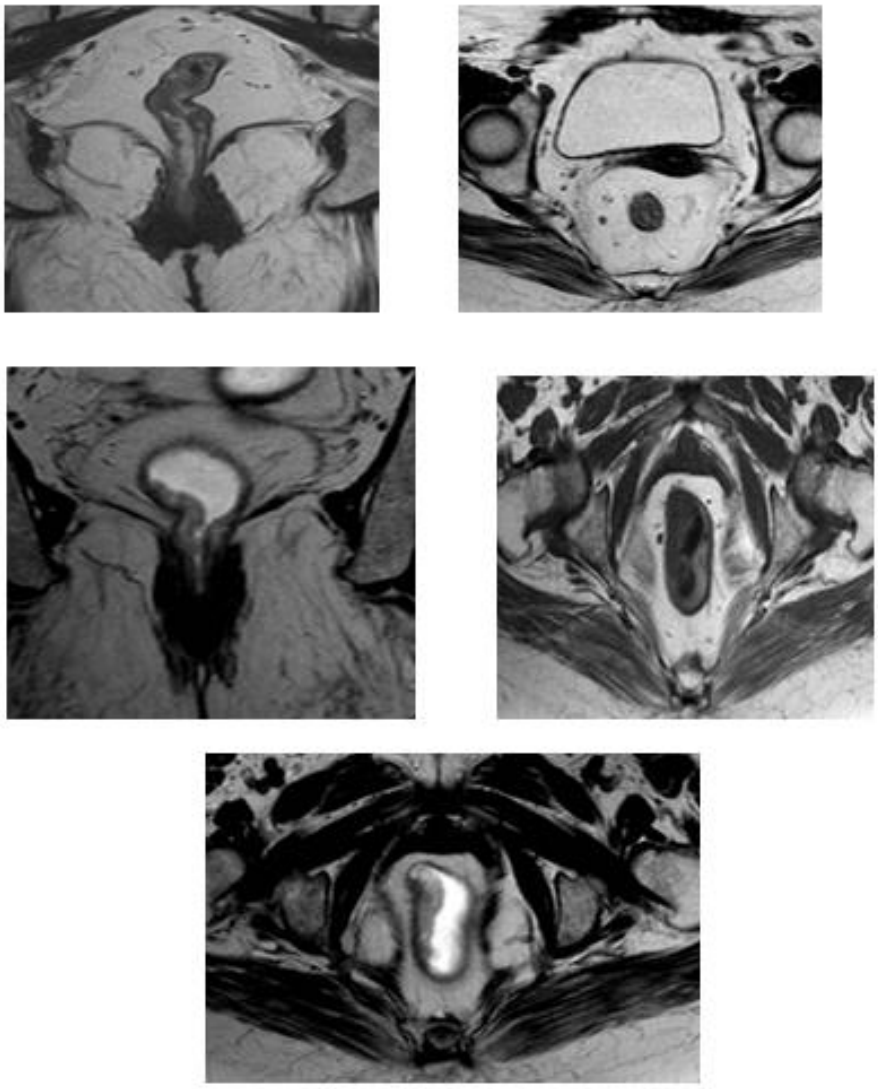

Fig. 3 A,b) Coronal and axial T2 Wis before rectal gel administration for known case of cancer rectum show less accurate assessment of the involved site of the rectum due lack of proper distention .

C,d,e) Coronal T2,axial T1 and T2 Wis after trans-rectal gel administration show irregular mural wall thickening seen infiltrating the submucosa and extending to the muscularis properia of the lower 1/3 of the rectum and anorectal junction with no extra serosal extension and Intact mesorectal fate and fascia , It is seen extending about 4.5 cm from the anal verge . It is seen associated with small perirectal lymph nodes (about 2 in number) are noted showing restricted diffusion .

Discussion

In the present study, we include 60 patients with primary rectal cancer. Mucinous adenocarcinoma was the histopathological results in 37 patients out of 60 i.e 61.67% while [9], found the percentage of mucinous adenocarcinoma to be 43.6% in his study.

Kaur et al [3] in agreement with our study in using the pelvic phased array coil with

administration of endorectal warm gel to distend the involved rectal lumen and in all cases we have injected intravenous spasmolytic material (Buscopan) just prior to the examination that is reduce motion artifacts and improving image quality . Contrast material was injected in all patient evaluated using pelvic phased array coils alone with a bolus dose of 0.1mmol of gadopentate dimeglumine per kilogram of body weight to enhance tissue contrast.

Kim et al [10] in agreement of our study in that High-resolution T2-weighted imaging is the key sequence in the magnetic resonance (MR) imaging evaluation of primary rectal cancer. This sequence generally consists of thin-section (3-mm) axial images obtained orthogonal to the tumor plane, with an in-plane resolution of 0.5–0.8 mm. This technique allows differentiation between rectal tumors confined within the rectal wall (stage T2 tumors) and those that extend beyond the muscularis propria (stage T3 tumors) and also can assess the depth of invasion outside the muscularis propria. In addition, high-resolution T2-weighted images allow the morphologic assessment of pelvic nodes, thereby improving accuracy in the characterization of nodes as benign or malignant, since size criteria have proved to be of limited value.

Currently, surgical resection with stage-appropriate neoadjuvant combined-modality therapy is the mainstay in the treatment of rectal cancer. In the past decade, the increasingly widespread adoption of total mesorectal excision (TME) has resulted in a dramatic decline in the prevalence of local recurrence from 38% to less than 10%. TME is a surgical technique that entails en bloc resection of the primary tumor and the mesorectum by means of dissection along the mesorectal fascial plane or the circumferential resection margin (CRM). Even with TME, however, the presence of a tumor or malignant node within 1 mm of the CRM remains an important predisposing factor for local recurrence. Consequently, reliable preoperative imaging evaluation is vital to surgical planning. [11]

High-resolution T2-weighted images be obtained in three planes: the sagittal and coronal planes, in addition to the axial plane orthogonal to the tumor. This approach improves confidence in the assessment of tumor stage because the relationship of the tumor to the muscularis propria can be confirmed in three planes. This is of particular value in the imaging of tortuous rectal tumors, in which accurate positioning of the axial plane is difficult and determination of the depth of penetration through the muscularis propria may rely on the high-resolution sagittal and coronal views.

High-resolution multiplanar imaging provides superior evaluation of the relationship of tumor to the peritoneal reflection, a factor that is important in tumor staging, since invasion of the peritoneal reflection upgrades the tumor to a stage T4 lesion. We have frequently observed that this relationship is better defined on coronal and sagittal images. [10]

As has been reported in previous articles, coronal high-resolution T2-weighted images are essential for assessing the relationship of

tumor to the anal sphincter; however, instead of obtaining coronal images parallel to the tumor plane, we obtain straight coronal high-resolution images of the pelvis . The straight coronal images provide definition of the anatomy of the anal sphincter and of the relationship of the tumor to the sphincter, with the added benefits of assessment of tumor relationship to the pelvic sidewall and peritoneal reflection, as well as evaluation of pelvic sidewall nodal morphology. They improve assessment of the relationship of the tumor to the pelvic sidewall because subtle strands of tumor infiltration that can be missed on large- FOV T2-weighted images are easily identified on high-resolution images. **(7)**

Mercury Study Group **(12)** in agreement of our study in that high-resolution MR imaging is a reliable and reproducible technique predicting the depth of tumor invasion outside the muscularis propria ,a negative CRM, the relationship of the tumor to the CRM .in our study its specificity, sensitivity and accuracy were about 96.77% , 98.28% and 96.92% respectively which show no significant changes in comparison to mercury study group 2007 (specificity 92%) and the **(9)** (specificity 100% and accuracy 92.1). **(13)** (the sensitivity, specificity, and accuracy were 98%, 96%, and 97%, respectively).

Our study is in agreement with other researchers **(14),** in that Preoperative MR prediction of histologically involved MRF is very accurate (sensitivity 100%; specificity 100%).

The assessment of nodal involvement remains a confounding factor. Patients with malignant adenopathy should receive chemotherapy–radiation therapy; however, cross-sectional imaging relies on size as a criterion for nodal involvement, which has significant limitations. High-resolution MR imaging allows the assessment of nodal morphology, which significantly improves specificity in the assessment of nodal involvement **(13).**

In our study specificity ,sensitivity and accuracy of lymph nodes involvement were 87.50%, 97.73% , 88.52% respectively but the Zhang et al 2008 results were lower than our study (specificity, sensitivity and accuracy 79.0 %,64.7%, 90.5%) this difference might be due to the fact that ,in our study we depend mainly on morphological criteria of the lymph nodes ,diffusion pattern and its ADC value and considering the lymph node size significant if less than 5mm while his study done on limited number of cases(38 cases only).

The present study agrees with **(15)** in that assessment of lymph node involvement in primary rectal cancer should involve the evaluation of the following nodal groups: mesorectal, superior rectal and inferior mesenteric; internal, external, and common iliac; retroperitoneal; and superficial inguinal.

Kim et al **(10)** is in agreement with our study in that nodes within the confines of the mesorectal fascia are resected during TME. And these nodes should be assessed in terms of their involvement (i.e., benign or malignant) and the relationship of clearly

malignant nodes to the mesorectal fascia. If a malignant node or tumor deposit abuts (i.e. is less than 1 mm from) the mesorectal fascia, this information is important to the surgeon, who must stay well clear of the tumor at that margin. Lymph nodes outside the mesorectal fascia along the pelvic sidewall are not routinely resected. However, if involvement of these nodes can be established preoperatively, it is important to modify the treatment approach to avoid recurrence in untreated nodes. Involved extramesorectal lymph nodes can be targeted with a widened field for preoperative radiation therapy and extended surgical resection. Moreover, it is important to evaluate these nodes for the purposes of staging, since malignant external iliac and superficial inguinal nodes imply stage M1 disease.

It is well established that nodal size is of limited value in assessing for the presence of metastasis. The most frequently used size criterion for distinguishing malignant from nonmalignant nodes (i.e. 5 mm) has a sensitivity of 68% and a specificity of about 78% [(17).] The limited accuracy of nodal size is likely related to the fact that 30%–50% of metastases in rectal cancer occur in nodes that are less than 5 mm. [(16).]

Recently, it was reported that nodal margins and internal nodal characteristics are the most reliable indicators of malignancy. Features that are suggestive of malignancy include irregular or speculated nodal margins and heterogeneous signal intensity in addition to the restricted diffusion pattern of the involved node. The evaluation of these features requires high-resolution images that cover all nodes of importance, including superior rectal and pelvic sidewall adenopathy [(11).]

MR imaging in coronal plane is very useful for detecting tumor involvement of the levator ani muscles. If levator ani muscles are involved, an anterior resection should not be performed, an abdominoperineal resection is needed. also if muscle, nerve, or bony involvement is suspected or if extensive and invasive disease is expected, MRI imaging is of choice because of ease with which this technique can assess tumor extension into these structures.MR imaging can assess the various soft tissue components of many pelvic organs and can more readily identify soft tissue planes between pelvic organs and masses [(15).]

Conclusion

Preoperative MRI has a golden standard value in the establishment of the best treatment strategy.

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To cite this article: Ahmed I. Ebeed, Mohammed F. Abd El Aziz, Medhat M. Refaat, Mohamed I. Hassan.The Role of MR Imaging in Local Staging and Assessment of Sphincteral Invasion in Rectal Carcinoma. BMFJ 2023;40(Radiology): 85-99.