IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 1 Ser.7 (January. 2022), PP 54-62
www.iosrjournals.org

Preoperative Pelvic MRI for Loco-Regional Staging of Primary Rectal Carcinoma and its Correlation with Postoperative Histopathology Report

Dr. Bilkis Fatema[1]*, Professor Shahadot Hossain Sheikh[2], Dr. Krishna Pada Saha[3], Dr. Golam Mustafa[4], Dr. Shafayat Muhammed[5]

[1]*Assistant Professor, Colorectal Surgery Department, Dhaka Medical College & Hospital, Bangladesh*
[2]*Chairman, Colorectal Surgery Department, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh*
[3]*Junior Consultant (Surgery), Shaheed Suhrawardy Medical College Hospital, Bangladesh*
[4]*Assistant Professor, Colorectal Surgery Department, Dhaka Medical College & Hospital, Bangladesh*
[5]*Registrar, Department Of Surgery, Dhaka Medical College & Hospital, Bangladesh*
**Correspondence: Dr. Bilkis Fatema*

Abstract
Background: *Primary rectal carcinoma is the most common malignant tumors of the gastrointestinal tract. We present our comparative findings in preoperative pelvic MRI for Loco-Regional Stag of primary Rectal Carcinoma.* ***Methodology:*** *The study was carried out on all patients with clinically and Histopathologically proven rectal carcinoma admitted in surgery department of Bangabandhu Sheikh Mujib Medical University Hospital (BSMMU), Dhaka, Bangladesh from April 2015-October 2015. It was observed that 10-15 patients fulfill the inclusion criteria in one month. The total duration of the study was 6 month and the population size 70 that was roughly estimated. The data were entered into computer and statistical analysis of the results being obtained by using windows-based computer software devised with Statistical Packages for Social Sciences SPSS 161. Statistical significance was set at p<0.05 and confidence interval set at 95% level.* ***Results:*** *The age distribution of the patients. In this study the age of the patients ranges from 18- 85 years. Maximum age incidence was found in 51-60 years age group. Mean standard deviation was 49.51 = 15.79. [Table 1] shows pre- and post-operative T staging. Pre-operative staging was T2-16 (31.50%), T3-38 (68.5%) and post-operative T staging were T2-18(33.3), T3- 26 (48.2) and T4-(18.5%) respectively. [Table 6] shows comparison of MRI diagnosis with histopathology in diagnosis of local T staging (T3) of primary rectal carcinoma. Here true positive, false positive, false negative and true negative were12, 4, 6 and 32 respectively. Difference between these two groups was statistically significant (p value 0.001). [Table 4] The validity test results. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in assessment of CRM were 90.0%, 97.7%. 90.0%, 97.7% and 96.3% respectively. [Table 11]* ***Conclusion:*** *MRI is a valuable technique for the preoperative staging of rectal cancer, especially in the differentiation of T2 and T3 tumors and the feasibility of TME surgery, which are the main factors affecting the outcome of surgery.*

Keywords: *Preoperative Pelvic, Rectal Carcinoma, Histopathology Report*

Date of Submission: 01-01-2022 Date of Acceptance: 12-01-2022

I. Introduction

Rectal cancer is one of the most common tumors in industrialized countries affecting about 40 cases in every 100.000 individuals, and one of the most common malignant tumors of the gastrointestinal tract. Adenocarcinoma accounts for the vast majority (98%) of rectal cancer. The higher prevalence in the West as compared to the developing world has been attributed to differences in diet (Ghieda, 2013). The disease is more common after the age of 50 and shows a slight male predilection. Over the last decade, many improvements have been made in the management of rectal cancer. With better radiological staging, curative surgical resection is becoming more popular. However, carcinoma of rectum remains associated with a poor prognosis owing to the high risk of metastases and local recurrence. Local tumor spread, involvement of lymph nodes, and distant metastases all influence the prognosis of rectal cancer (Mullah, 2010). There is an increasing need for accurate preoperative staging because aggressive multimodality treatment approaches are being employed these days based on individual risk factors. After surgical treatment, local recurrence rates for rectal cancer can vary from 3% to 32%. Histopathologic tumor involvement of the circumferential resection margin (CRM), which is the

peritoneal reflection of the mesorectal fascia has been shown to be an independent predictor of local recurrence and hence, influences overall survival after primary resection. The mesorectal fascia represents the potential CRM in patients undergoing TME surgery (Karatag, 2011).

Total mesorectal excision (TME) involves en-block resection of both the tumor and thesurrounding mesorectal fat. At present, TME is the surgical treatment of choice for rectal cancer, being associated with a recurrence rate of less than 10% when used as a single-modality therapy. The introduction of this surgical technique reduced the mortality rate associated with rectal cancer from 16% to 9% in one study. In selected patients with involvement of the mesorectal fascia at the time of diagnosis, the use of preoperative radiation therapy is advocated and has been shown to reduce the recurrence rate from 8.2% to 2.4% at 2 years (Bipat, 2004). This therapeutic approach demands accurate preoperative tumor staging—namely, detection of rectal carcinoma infiltration into the mesorectal fat, involvement of the mesorectal fascia, and nodal involvement. The goal of imaging in rectal cancer is to stratify cases on the basis of the risks of recurrence by means of accurate evaluation of the T staging. At present, there is no consensus on the role of diagnostic imaging like endorectal ultrasonography (US), computed tomography, and magnetic resonance [MR] imaging in the preoperative T staging of rectal cancer.

MRI is a promising tool for staging rectal cancer preoperatively and can also provide measurements of the distance to the mesorectal fascia, which forms the potential resection margin in total mesorectal excision (Janjua, 2014). Preoperative imaging for rectal cancer staging is useful to determine which surgical technique would be more appropriate: recently-developed local excision method of trans-anal resection or traditional radical resections such as low anterior resection or abdomino-perineal resection. Physical examination, colonoscopy and boipsy are used for the diagnosis of carcinoma of rectum. Imaging modalities are used for preoperative staging of rectal cancer like USG of abdomen, endorectal USG, CT scan, MRI of pelvis. Ideal imaging modality should accurately assess the depth of tumor penetration(T), lymph node involvement N), presence of distant metastatic disease(M), mesorectal fascia involvement, and anal sphincter involvement. Currently, there is no consensus on a preferred imaging technique for preoperative staging of rectal cancer. High-resolution MRI is recommended as a standard imaging modality for preoperative local staging of rectal cancer, with excellent soft tissue contrast, functional imaging ability, and multi-Planar capability (The ASCRS textbook 2" edition, 2011.). With these inherent proprieties, MRI fills a gap in clinical practice and helps accurate local staging of rectal cancer prior to management decisions. This study was mainly focused on the role of MRI in preoperative loco-regional staging of rectal cancer and discuss recent advancements in MRI technique.

II. Objective

General Objective:

To determine the efficacy of pelvic MRI for the preoperative loco-regional staging of rectal carcinoma and planning of surgical management.

Specifics Objective:

To assess clinical staging preoperatively.
To correlate with pathological staging after operation.
To determine the usefulness and limitation of pelvic MRI for rectal carcinoma.

III. Methodology

The study was carried out on all patients with clinically and Histopathologically proven rectal carcinoma admitted in surgery department of Bangabandhu Sheikh Mujib Medical University Hospital (BSMMU), Dhaka, Bangladesh from April 2015-October 2015. It was observed that 10-15 patients fulfill the inclusion criteria in one month. The total duration of the study was 6 month and the population size was roughly estimated 70 during the study period. Inclusion criteria were all patients with histologically proven carcinoma of rectum admitted in BSMMU surgery department. Exclusion criteria were Patient with carcinoma of rectum having distant metastasis, Patient with post chemoradiation/ radiation state, Contraindication of MRI, Patient having severe co-morbidities and Patients who refuse to do operation. Data were collected using a preformed data collection sheet (questionnaire). The data were entered into computer and statistical analysis of the results being obtained by using windows-based computer software devised with Statistical Packages for Social Sciences SPSS 161. Agreement between MRI- and histologically determined tumor stages was assessed using the weighted kappa statistic. Statistical significance was set at $p<0.05$ and confidence interval set at 95% level.

IV. Results

Total 54 patients of both sexes were entered into this study according to the inclusion and Wcion criteria. On admission, patients who were diagnosed as carcinoma of rectum and need exclusion crite surgery included in this group. shows the age distribution of the patients. In this study the age of the patients ranges from 18-85 years. Maximum age incidence was found in 51-60 years age group. Mean standard deviation was 49.51±15.79. Sex distribution of the patient. Out of 54 patients 37 (68.82%) were male and 17 (31.48%) were female. Male are more sufferer than female. Pre-operative N distribution. No- 12 (22.2%), N, - 26 (48.1%) and N_2-16 (29.6%). Postoperative N_0-6 (11.1%), N_1 - 20 (37.0%) and N_2- 28 (51.9%). The validity test results. Sensitivity, specificity, positive predictive value negative predictive value and accuracy of MRI in diagnosis of local staging(T2) of primar rectal carcinoma were 66.7%, 86.1%, 70.6%, 83.8% and 79.6% respectively. Comparison of MRI with histopathology for staging (T3) of primary rectal carcinoma. Here true positive, false positive, false negative and true negative were 21, 17, 5 and 11 respectively. The validity test results. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in diagnosis of T staging (T3) of primary rectal carcinoma were 84.8%, 45.9%, 73.7%, 68.8% and 72.3% respectively. Comparison of MRI with histopathology for loco-regional staging (NO) of primary rectal carcinoma. Here true positive was 2, false positive was 10, false negative was 4 and true negative was 38. The validity test results. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in diagnosis of loco-regional staging (N_0) of primary rectal carcinoma were 33.3%, 79.2%, 16.7%, 90.5% and 74.1% respectively. The validity test results. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in diagnosis of loco-regional staging (N_2) of primary rectal carcinoma were 50.0%, 92.3%, 87.5%, 63.2% and 70.4% respectively. The validity test results. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in assessment of CRM were 90.0%, 97.7%. 90.0%, 97.7% and 96.3% respectively.

Table 1. Distribution of population according to age (n=54).

Age (year)	n=54	%
< 30	8	14.8
31 - 40	6	11.1
41 - 50	14	22.2
51 - 60	12	25.9
61 - 70	10	18.5
>70	4	7.4
Total	54	100.0
Mean±SD	49.51±15.79	
Range	18-85	

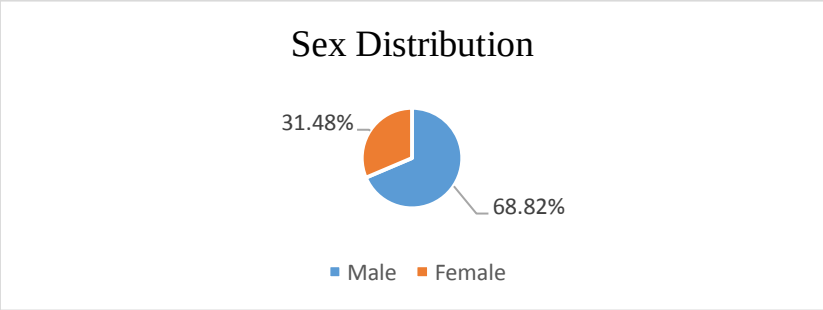

Table 2: Distribution of population according to pre and post-operative T staging.

T Staging	Pre-operative (MRI)		Post-operative Histopathology	
	n=54	%	n=54	%
T_1	0	0.0	04	7.40
T_2	16	31.5	18	33.3
T_3	38	68.5	26	48.2
T_4	0	0.0	10	18.5
Total	54	100.0	54	100.0

Table 3: Distribution of population according to pre and post-operative N staging.

T Staging	Pre-operative (MRI)		Post-operative Histopathology	
	n=54	%	n=54	%
N_0	12	22.0	06	11.1
T_1	26	48.1	20	37.0
T_2	38	68.5	28	51.9
Total	54	100.0	54	100.0

Table 4: Comparison of MRI with histopathological diagnosis for staging (T2) of primary rectal carcinoma.

MRI	Histopathology				Total		P Value	Kappa Value
	Positive		Negative					
	n	%	n	%	n	%		
Positive	12	66.7	4	13.9	16	31.5	0.001	0.535
Negative	6	33.3	32	86.1	38	68.5		
Total	18	100.0	36	100.0	54	100.0		

Chi square test was done to measure the level of significance

Table 5: Validity parameters of MRI for staging (T2) of primary rectal carcinoma

Test Parameters	%	95%CI
Sensitivity	66.7	46.1 – 81.4
Specificity	86.1	75.8 - 93.5
PPV	70.6	48.8 – 86.2
NPV	83.8	73.8 – 91.0
Accuracy	59.6	*55.9 - 79.5*

Table 6: Comparison of MRI with histopathological staging (T3) of primary rectal carcinoma.

MRI	Histopathology				Total		P Value	Kappa Value
	Positive		Negative					
	n	%	n	%	n	%		
Positive	21	74.0	17	26.0	38	70.4	0.107	0.897
Negative	5	19.2	11	39.3	16	29.6		
Total	26	100.0	28	100.0	54	100.0		

Chi square test was done to measure the level of significance

Table 7: Validity parameters of MRI for staging (T3) of primary rectal carcinoma

Test Parameters	%	95%CI
Sensitivity	84.8	66.3 – 92.0
Specificity	45.9	35.8 – 59.7
PPV	73.7	45.3 – 62.9
NPV	68.8	45.2 - 86.9
Accuracy	72.3	58.3 – 840.0

Table 8: Comparison of MRI with histopathological for staging (N_0) of primary rectal carcinoma.

MRI	Histopathology				Total		P Value	Kappa Value
	Positive		Negative					
	n	%	n	%	n	%		
Positive	2	33.3	10	50.0	12	22.2	0.487	0.897
Negative	4	66.7	38	50.0	42	77.8		
Total	6	100.0	88	100.0	54	100.0		

Chi square test was done to measure the level of significance

Table 9: Validity parameters of MRI for loco-regional staging (N_0) of primary rectal carcinoma

Test Parameters	**%**	**95%CI**
Sensitivity	33.3	6.1 – 74.0
Specificity	79.2	75.8 – 84.2
PPV	16.7	3.1 – 37.0
NPV	90.5	86.6 - 96.3
Accuracy	74.1	68.0 – 83.1

Table 10: Comparison of MRI with histopathological for loco-regional staging (N_1) of primary rectal carcinoma.

MRI	Histopathology				Total		P Value	Kappa Value
	Positive		Negative					
	n	%	n	%	n	%		
Positive	16	80.0	12	50.0	28	51.9	0.001	0.487
Negative	4	20.0	22	50.0	26	48.1		
Total	20	100.0	34	100.0	54	100.0		

Chi square test was done to measure the level of significance

Table 11: Validity parameters of MRI for loco-regional staging (N_1) of primary rectal carcinoma

Test Parameters	%	95%CI
Sensitivity	80.0	60.4 – 92.8
Specificity	64.7	53.2 – 72.3
PPV	54.1	43.1 – 66.3
NPV	84.6	69.5 – 94.5
Accuracy	70.4	55.8 – 79.9

Table 12: Comparison of MRI with histopathological for loco-regional staging (N_2) of primary rectal carcinoma.

MRI	Histopathology				Total		P Value	Kappa Value
	Positive		Negative					
	n	%	n	%	n	%		
Positive	14	50.0	2	7.7	16	29.6	0.001	0.416
Negative	14	50.0	24	92.3	38	70.4		
Total	28	100.0	26	100.0	54	100.0		

Chi square test was done to measure the level of significance

Table 13: Validity parameters of MRI for loco-regional staging (N_2) of primary rectal carcinoma

Test Parameters	%	95%CI
Sensitivity	50.0	36.8 – 55.9
Specificity	92.3	78.1 - 98.6
PPV	87.5	64.5 -97.7
NPV	63.2	53.5 - 67.5
Accuracy	70.4	56.7 – 76.4

Table 14: Comparison of MRI with histopathology for CRM

MRI	Histopathology				Total		P Value	Kappa Value
	Positive		Negative					
	n	%	n	%	n	%		
Positive	9	50.0	2	7.7	10	18.5	0.001	0.877
Negative	1	10.0	43	92.3	44	81.5		
Total	10	100.0	44	100.0	54	100.0		

Chi square test was done to measure the level of significance

Table 15: Validity parameters of MRI examination for the assessment of CRM.

Test Parameters	%	95%CI
Sensitivity	90.0	61.7 -99.1
Specificity	97.7	91.3 – 99.8
PPV	90.0	61.7 -99.1
NPV	97.7	91.3 - 99.8
Accuracy	96.3	85.8 – 99.7

V. Discussion

Traditionally, local staging works up of carcinoma of rectum consists of pelvic MRI and/or endorectal ultrasound. While previously all patients underwent a standardized resections either anterior resection or APR, now a days imaging can identify the high risk patients with locally advanced rectal cancer needs preoperative neo-adjuvant therapy (Lambregts and Beets- Tan 2013). On the other hand, very early lesion can be treated with local excision or endoscopic micro surgery. Initial studies with body coil MRI were not promising (Guinet et al.

1988) and reported accuracy in predicting the depth of rectal tumor penetration was around 60% (Hodgman et al. 1986). USG is the most widely used imaging technique. It depicts the anatomic layers of the rectal wall with high accuracy and enables a precise determination of the tumor extent. Reported accuracy rates of EUS for the assessment of the T stage were in the range of 69%-97 (Akasu et al, 2009). However, EUS is invasive and operator dependent. It cannot be performed in stenotic tumors or in tumors that are localized close to the sigmoid colon. The assessment of the mesorectal fascia and tumor extension into neighboring organs is not possible because of the limited field of view.

CT has limitations in differentiating and distinguishing different layers of the rectal wall, and it has a lower overall accuracy rate than EUS and MRI. However, Ahmetoğlu et al. 2011 showed that multi-detector CT can be highly accurate in the prediction of T staging, N staging, International Union Against Cancer (IUCC) staging, and mesorectal fascia involvement in the preoperative local staging of rectal cancer. In contrast to these results, Juchems et al, in 2009 stated that multidetector CT fails to reliably identify IUCC I in rectal cancer patients. Therefore, they concluded that a strategy for identifying patients who would benefit from neoadjuvant therapy that was based solely on multi-detector CT did not seem appropriate. MRI shows excellent overall accuracies in the diagnosis of mesorectal fascia and adjacent organ invasion of88% 100% and 100%, respectively (Zhang et al. 200839). This high accuracy rate has not beenachieved by EUS, conventional CT or multi-detector CT. This MRI technique depicts the detailed anatomy of the rectal wall and perirectal structures that are related to TME.

This cross sectional study was conducted from April 2015 to October 2015 over a period of 06 (six) months in the colorectal unit of surgery, BSMMU, Dhaka. The purposes of the study was to evaluate the accuracy of magnetic resonance imaging (MRI) for preoperative loco-regional tumor staging in primary rectal cancer and reflect the treatment decision-making. So, the appropriate treatment can be given. Patients were selected according to inclusion criteria. MRI scan was perform prior to surgery in all patients. Dedicated histopathologists will report the histology slides.

Colorectal cancer is more common in older population (>60 years), but in this study, age of the patients ranges from 18-85 years and maximum age incidence was found in 51-60 years age group (table-1). Many patients >60 years were excluded from this study due to inoperability for morbidity and advance stage. But many international studies showed that the risk of getting colorectal cancer increases with age >60 years (CDC, 2014). Out of 54 patients 37 (68.80%) were male and 17 (31.44%) were female. Male were moreHuded than female. In Bangladesh, most of the patient live in the village, mostly they are tale. Due to our social customs and culture, the female patients feel shy to come to physician of treatment of disease specially involving private parts including perineum. They are also dependent on their male family members to take them to the physician. Until the problem becomes unbearable, most of the female in our country do not come to doctor. So, in this study, of female are found to be less though both sex groups suffer equally from the rectal carcinoma. The same scenario has been seen in other international studies also, (WHO.2002 and Haggar et al.2009).

Along with staging, grade of tumor determine the treatment plan and prognosis of the patient. In this study grade 2 tumor are common 24 (44.4%), grade 2 and grade 1 are 16 (29.6%) and 14 (25.6 %). There is no published article regarding grading incidence of carcinoma of rectum. The identification and staging of rectal cancers at MR imaging is largely based on differences in T2 signal intensity between the tumor, the mucosa and submucosal layers, the muscular layer, the perirectal fat, and the mesorectal fascia. The peri-rectal fat has high signal intensity on turbo spin-echo T2-weighted images and surrounds the low-signal-intensity muscularispropria. The tumor itself has an intermediate signal intensity between the high signal intensity of the fat tissue and the low signal intensity of the muscular layer. Furthermore, its signal intensity is higher thanthat of the mucosal and submucosal layers. At histopathologic analysis, a stage Tl tumor is Characterized by infiltration of the submucosal layer and sparing of the muscularis propria at phased-array MR imaging, differentiation between stage Ti and stage T2 tumors is rather Ticult owing to low spatial resolution. There was no preoperative T1 tumor in this study. But postoperative histopathology revealed 05 Ti. In This study Table 5 shows comparison of MRI diagnosis with histopathology for T2 primary rectal carcinma. Here12 cases were correctly diagnosed by MRI, 4 cases were over staged. Chisquare test was done to measure the level of significance. Difference between these two groups was statistically significant (p-value 0.001). Kappa test was done to see the agreement between MRI and histopatholoy report. Agreement between two groups was fair (0.535).

Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI were 66.7%, 86.1%, 70.6%, 83.8% and 69.6% respectively for T staging. Stage 12 tumors are generally characterized by involvement of the muscular layer, with loss of the interface between this layer and the submucosa. The muscular layer is partially reduced in thickness, although the outer border between the muscularis propria and the perirectal fat remains intact. In differentiating between stage T2 and stage T3 tumors, the crucial criterion is involvement of the perirectal fat, which is characterized by the inability to visualize the interface between the muscular layer and the perirectal fat, with a rounded or nodular advancing margin. In stage T3 tumors, the muscularis propria is totally disrupted and cannot be clearly distinguished from the perirectal fat. Karatağ et al.

2012, showed the overall accuracy of MRI for T-staging was 79.2%; the accuracies were 42.8% for T1 and 65% for T2 tumors and 94% for T3 tumor. Previous studies reveal that the differentiation of Ti from T2 lesions is difficult (Laghiet al. 2002).

In our study, the low accuracy rate in the staging of T2 tumors was due to an over staging and of these lesions as T3 tumors and understaging of T2 tumour. The literature states that this his take is the most frequent pitfall because of the inability of MRI to distinguish the spiculation he perirectal fat that is caused by fibrosis alone from spiculation that is caused by fibrosis containing tumor cells. Peritumoral fibrosis can be seen as spiculation with a lower signal been intensity compared to the broad-based or nodular appearance of an advancing tumor margin.Distinguishing T3 from T2 lesions is very important for the use of preoperative therapy, and the crucial criterion is the infiltration of perirectal fat. An absence of hypointensity of the muscle layer between the edge of the tumor and the extramural soft tissue is the criteria for T3. In the evaluation of stage T3 tumors, one parameter is particularly important: the minimum distance between the tumor and the mesorectal fascia. This measurement is important for the stratification of cases on the basis of potential recurrence after TME. Indeed, despite good quality TME surgery, 15%-20% of TME specimens have a positive CRM.

Our study demonstrated the high accuracy of preoperative MRI in the prediction of correct T3 stage; the agreement with histopatholgy was about 0.897.and it correlated with the data reported in the most of the studies published in literature (65%-100%) (Blomqvistet al 2000 and Gagliardil. 2002).and accuracy of MRI in diagnosis of T staging (T3) of primary rectal carcinoma were 84.8%, 45.9%, 73.7%, 68.8% and 72.3% respectively. The traditional body coil MRI studies have ranged in accuracy from 55% to 95%. The addition endo-rectal coil to this technique resulted in T stage accuracy rates of 66%-91%.(Kim et al. in the largest published trial to date examining the accuracy of MRI staging of rectal Cance Et, compared the histopathologic staging with the preoperative staging in 217 patients. In their article, Brown et al, 2004. Introduced new criteria to define MRI T staging. The accuracy for the depth of al.2004, examined proof invasion was 81% and for regional lymph node metastasis was 63%. Brown et mined preoperative prognostic factors in 98 patients with rectal cancer using high resolution MRI wit MRI with a thin section technique. The accuracy rate in assessing the T stage was 94%, for lymph node involvement was 84%. Detecting lymph node metastasis is the most challenging aspect of MRI diagnosis of rectal cancer. Kim et al. in 1999, found that the accuracy rates of MRI, CT, and endoluminal sonography for local lymph node metastasis of rectal cancer were 63%, 56.5%, and 63.5%, ctively. The accuracy of imaging is low mainly because the diagnosis of metastasis is made only on the basis of the size and shape of lymph nodes, and thus micro-metastasis is missed. Because lymph nodes enlarge in both inflammatory and neoplastic processes, which are difficult to differentiate morphologically, false-positive and false-negative results occur. In numerous studies, lymph nodes larger than 1 cm have been considered metastasis. In other studies, cutoffs of 8 mm and 6 mm have been used (Urban et al. 2000). With greater than 6 mm as the criterion for the diagnosis of lymph node metastasis around the rectal wall and surrounding fat, the sensitivity, the specificity, and the accuracy were only 57%, 88%, and 54% respectively. MRI identification of metastatic lymph node involvement has not been standardized, which may explain the great variation in accuracy. Kim et al. 1999, considered lymph node involvement if they demonstrated heterogeneous texture, irregular margins, or were enlarged to greater than 10 mm. Brown et al. 2004, analyzed 437 lymph nodes and concluded that benign and malignant lymph nodes were similar in size. Those authors believed that accuracy could be increased by evaluating lymph node borders and signal intensity. They proposed that using irregular borders and mixed signal intensity as the criteria for metastatic lymphnodes would improve sensitivity to 85-95% and specificity to 95–97%.

In our study, criteria for lymph node metastasis include size greater than 6 mm, irregular border, mxed signal intensity and diagnostic performance of MRI for staging of (NO) of primary rectal carcinoma (table- XI) were 33.3%, 79.2%, 16.7%, 90.5% and 74.1% respectively. For N_1 sitivity, specificity, PPV, NPV and accuracy were 80.0%. 64.7%, 57.1%, 84.6% and staging, sensitivity, specific 1% respectively and 50.0%, 92.3%, 87.5%, 63.2% and 70.4% respectively N2 staging. Diffusion weighted imaging (DWI), for the detection of peri-rectal metastatic lymph nodes, is an effective tool. A limitation of the study is that DWI was not available in BSMMU.

In recent years, tumor involvement of the circumferential resection margin (CRM) has been identified as an important predictor of loco-regional recurrence in rectal cancer patients undergoing a radical proctectomy with total mesorectal excision (TME). Preoperative assessment of the relationship of the tumor with the fascia propria of the rectum, the CRM in patients treated with TME, has become of utmost importance in deciding the type of neoadjuvant therapy and planning the surgical resection. The fascia propria of the rectum is well visualized by surface coil or endorectal coil MRI and several studies have suggested that MRI can predict with high degree of accuracy for the distance of the tumor to the fascia propria of the rectum. Furthermore, because of its multiplanar capabilities, MRI is the most accurate imaging technique in assessing the relationship of the tumor with the levator plate and the sphincter complex. This information may be useful in selecting patients with low rectal cancer for a sphincter-saving procedure. The presence of tumor signal intensity that extends into

the perirectal fat is correlated best with a T3 tumor best with a T3 tumor on MRI images, but it is difficult to distinguish spiculation in the perirectal fat that is caused by fibrosis of I fat that is caused by fibrosis only from spiculation that is caused by fibrosis containing tumor cells. The mesorectal fascia represents the CRM, and tumoral involvement of the CRM has a high recurrence rate. Therefore, the main purpose of the preoperative staging of rectal tumors with MRI is to identify patients with T3 lesions, a subset of whom have potential CRM involvement and may benefit from neoadjuvant treatment (e.g., radiation therapy and chemotherapy).
With this surgical approach, the precise T-staging is less important than a correct diagnosis of mesorectal fascia involvement and the determination of the relationship between the tumor and anal sphincters. Invasion of the mesorectal fascia leads to adjunct radiochemotherapy to reduce the recurrence rate, but the invasion of anal sphincters changes the surgical technique. Recent studies reveal accuracy rates between 91%-100% for the prediction of mesorectal fascia invasion.

Wibe et al. 2002, have reported the impact of negative CRM in 686 patients who underwent total mesorectal excision. Local recurrence rate was 22% in patients with positive CRM (<1mm), while 5% in patients with negative CRM (>1 mm). Role of MRI in assessing relationship of tumor to the mesorectal fascia and predicting CRM involvement has been well studied. Karatag et al. (2012) showed that phased-array coil MRI had 95.8%accuracy for determining CRM inv6olvement and negative predictive value was 100%. Al-Sukhni et al. (2012) recently reported a meta-analysis of 21studies where MRI with phased-array coil was found to have 94% specificity(range, 88%–97%) for predicting CRM involvement, that phased-array coil MRI had 95.8% accuracy for determining CRM involvement and negative predictive value was 100%.

Accuracy of MRI for predicting CRM involvement might differ according to the tumor location. According to Peschaud et al. 2005, MRI was in agreement with pathological CRM involvement in 22% of patients with low anterior rectal tumors, 83% of patients with low posterior rectal tumors, and 100% of patients with mid-rectal tumors. When patients with low anterior rectal cer were excluded, the overall, agreement was 90%, with 100% sensitivity and 86% specificity.

The authors postulated that the presence of involvement of thin perirectal fat anterior to the rectum might limit to cum might limit the ability of MRI to detect anterior mesorectal fascia. Also the proximity of low anterior rectal wall low anterior rectal wall to seminal vesicle in men and posterior vaginal wall in women might contribute to the poor performa contribute to the poor performance of MRI in detection of CRM involvement in low anterior tumors. According to Beets-Tan et al. (2001) CRM can be predicted using MRI with a high accuracy and which allows for the preoperative identification of patients who are at risk of recurrence. Even with a successful TME, CRM positivity was 15%-20%. Our experience has confirmed that MR is the technique of choice in the preoperative localStaging of rectal cancer since it helps to estimate in a detailed and non-invasive way the entire mesorectal fat and all the surrounding pelvic structures, moreover, it allows to identify the diffeent risk group of patients helping to decide about the treatment and finally to optimize a complete excision allowing to those patients with an advanced rectal cancer to benefit from a sphincter-preserving surgery.

Limitation of the study

The study conducted in a single centre in Dhaka city which might not be representative to the whole population. Purposive sampling. Randomization was not done so, chance of bias was present. Shot study period and small sample size. Even the determined number of sample size was not available in this study.

VI. Conclusion

MRI is a valuable technique for the preoperative staging of rectal cancer, especially in the differentiation of T2 and T3 tumors and the feasibility of TME surgery, which are the main factors affecting the outcome of surgery. However, in order to achieve the desired accuracy and clinical benefit, an appropriately tailored imaging protocol must be utilized and prognostic factors must be carefully assessed.

VII. Recommendation

Preoperative detection of the nodal status is still a problematic and further studies are needed. However, larger, prospective and randomized trials are needed to establish the facts observed in the present as well as previous similar studies.

References

[1]. Ahmetoğlu, A., Cansu, A., and Baki, D. 2011, MDCT with multiplanar reconstruction in the meoperative local staging of rectal tumor. Abdom Imaging; vol. 36, pp.37-7.

[2]. Al-Sukhni, E., Milot, L., and Fruitman, M. 2012, Diagnostic accuracy of MRI for assessment of T category, lymph node metastases, and circumferential resection margin involvement in patients with rectal cancer: A systematic review and meta-analysis. Ann SurgOncol; vol.19: pp. 2212–11.

[3]. Akasu, T., Iinuma, G., and Takawa, M. 2009, Accuracy of high-resolution magnetic resonanceimaging in preoperative staging of rectal cancer. Ann SurgOncol; 16:2787–7.

[4]. Beets-Tan, R.G.H., Beets, G.L. 2004, 'Rectal cancer: review with emphasis on mrimaging', Radiology, vol. 232, no. 2, pp. 335–11.

[5]. Bellin, MF., Beigelman, C., Precetti-Morel, S. 2000, Iron oxide-enhanced MR lymphography:initial experience.Eur J Radiol; 34: 257–7.

[6]. Bipat, S., Las, D., Slors F., Zwinderman A., Bossuyt, P., Stoker J. 2004, Rectal cancer: Local ging and assessment of lymph node involvement with endoluminal US, CT and MRI imaging a meta-analysis', Radiology, vol. 232, pp. 773-10.

[7]. Blomqvist L., Machado M., and Rubio C. 2000, Rectal tumor staging: MR imaging using pelvic phased-array and endorectal coils vs endoscopic ultrasonography. EurRadiol, vol. 10: 653-8.

[8]. Brown. G., Kirkham, A., Williams, G. T., Bourne, M., Radcliffe, A. G., Sayman, J., et al. 2004, High-resolution MRI of the anatomy important in total mesorectal excision of the rectum', .AJR Am J Roentgenol, vol. 182, no. 2, pp. 431–9.

[9]. Brown, G., Radcliffe, A. G., Newcombe, R. G., Dallimore, N. S., Bourne, M. W., Williams, G. T. 2003, "Preoperative assessment of prognostic factors in rectal cancer using high-resolution magnetic resonance imaging', .Br J Surg, vol. 90, no. 3, pp. 355–64.

[10]. Brown, G. , Richards, C. J. , Bourne, M. W., Newcombe, R. G. , Radcliffe, A. G. Dallimore, N. S., et al. 2003,'Morphologic predictors of lymph node status in rectal cancer with use of high spatial-resolution MR imaging with histopathologiccomparison', Radiology, vol. 227, no. 2, pp.371–7.

[11]. Edge, S. B. B. D., Compton, C. C. Fritz, A. G., and Greene, F. L. 2010,'TrottiA.Colon and rectal. AJCC cancer staging manual'. 7th e, Berlin: Springer.

[12]. Ferri, M., Laghi, A.,Mingazzini, P.,M., Laghi, A.,Mingazzini. P. Jafrate, F., Meli, L., Ricci, F., et al. 2005, Pre-operativeassessment of extramural invasion and sphincteral involvement in rectal cancer by magnetic resonance imaging with phased-array coil',Cnaging with phased-array coil', Colorectal Dis, vol.7, no. 4, pp. 387–93.

[13]. Gagliardi G., Bayar S., Smith R., Salem RR., 2002, Preoperative staging of rectal cancer using netic resonance imaging with external phase-arrayed coils. Arch Surg, 137:447-6.

[14]. Gearhart, S. L., and Efron, J. E. 2011, "The preoperative staging of rectal cancer.In:Beek D. E, Roberts PL, Saclrides TJ, Senagore AJ, Stomas MJ, Wexner SD. The ASCRS textbook of colon and rectal surgery (2nded) Springer Science + Business Media, London, pp. 721-8.

[15]. Ghieda, U, Hassanen, O.,Eltomey, M. 2014, MRI of rectal carcinoma: Preoperative staging and planning of sphincter spring surgery', The Egyptian Journal of Radiology and Nuclear Medicine, vol. 45, pp. 1-5.

[16]. Group, M. S. 2006, Diagnostic accuracy of preoperative magnetic resonance imaging in predicting curative resection of rectal cancer: prospective observational study',BMJ, vol. 333,no. 7572, p. 779.

[17]. ladfield, M. B., Nicholson, A. A., MacDonald, A., W. Farouk, R., Lee, P. W., Duthie, G. S. etal. 1997, Preoperative staging of rectal carcinoma by magnetic resonance imaging with a pelvicphased-array coil', Br J Surg, vol. 84, no. 4, pp. 529-31.

[18]. Haggar F.A., Boushey R. 2009 Nov. Colorectal Cancer Epidemiology: Incidence, Mortality, Survival, and Risk Factors. Clin Colon Rectal Surg; 22(4): 191-6.

[19]. lafate F. Laghi, A., Paolantonio, P., Rengo, M., Mercantini, P., Ferri, M., et al. 2006, Preoperative staging of rectal cancer with mr imaging: correlation with surgical and histopathologic findings', Radio-Graphics, vol. 26, no. 3, pp. 701–14.

[20]. Janjua, A. Z., Moran B. J. 2014,'Rectal cancer. In: Philips R. K. S, Clark S. A companion to specialist surgical practice' 5'hed, Elsevier Ltd. UK, pp. 69-81.

[21]. Juchems MS., Ernst AS., and Kornmann M. 2009, Value of MDCT in preoperative local staging of rectal cancer for predicting the necessity for neoadjuvant radiochemotherapy. Rofo; 181:1168–8.

[22]. Kama NA., Reis E., and Doganay M. 2001, Radical surgery of coloncancers directly invading the duodenum, pancreas and liver. Hepatogastroenterology; 48:114 4.

[23]. Karatağ O., Karatağ Y. G., Özkurt H., Değirmenci H. K., Avlanmış O., et al 2012; The ability of phased-array MRI in preoperative staging of primary rectal cancer: correlation with histopathological results. Turkish Society of Radiology, DiagnIntervRadiol 18:20–26.

[24]. Kim, N. K., Kim, M. J., Yun, S. H., Sohn, S. K., and Min, J. S. 1999, Comparative study of transrectal ultrasonography, pelvic computerized tomography, and magnetic resonance imaging preoperative staging of rectal cancer', Dis Colon Rectum, vol. 42, no. 6, pp. 770-5.

[25]. Laghi A., Ferri M., Catalano C. 2002, Localstaging of rectal cancer with MRI using a phasedarray body coil. AbdomImaging; 27:425-431.

[26]. Lambregts M.J., Beets-Tan., Regina G.H. 2013. Optimal imaging staging of rectal cancer al imaging staging of rectal cancer. World J Surg, vol.37, pp. 12-8. A

[27]. Fuchsjager, M. 2003, 'Preoperative staging of rectal cancer',EurJRadiol, vol. 47, 110. 2, pp. 89–97.

[28]. Mizukami. Y., Ueda, S., Mizumoto, A., Sasada, T., Okumura, R., Kohno, S., et al. 2011 Diffusion-weighted magnetic resonance imaging for detecting lymph node metastasis of rectal cancer', World J Surg, vol. 35, no. 4, pp. 895–9

[29]. Mulla, M., Deb, R., Singh, R. 2010,'MRI in T staging of rectal cancer: how effective is it', Indian J Radiol Imaging, vol. 20, no. 2, pp. 118–21.

[30]. Ota, D.M., Jacobs, L., Kuvshinoff, B. 2002, "Rectal cancer: the sphincter-sparing approach",SurgClin North Am, vol. 82, no. 5, pp. 983–93.

[31]. Peschaud F., Cuenod CA., and Benoist D. 2005, Accuracy of magnetic resonance imaginginrectal cancer depends on locationof the tumor. Dis Colon Rectum; vol. 48: pp. 1603–1609.

[32]. Urban M., Rosen HR., Holbling N., Feil W., Hochwarther G., Hruby W., et al. 2000, MR Imaging for the preoperative planning of sphincter-saving surgery for tumors of the lower third the rectum: use of intravenous and endorectal contrast materials. Radiology;214(2):503–8.

[33]. Videhult, P.. Smedh, K., Lundin, P., Kraaz, W. 2007, Magnetic resonance imaging for perative staging of rectal cancer in clinical practice: high accuracy in predicting circumferential margin with clinical benefit', Colorectal Dis, vol. 9, no. 5, pp. 412–9.

[34]. Viccer B. C., Varma, M. G., Welton, M.L. 2001, 'Local therapy for rectal cancer', SurgOncol, vol. 10, no. 1-2, pp. 61-9.

[35]. Wibe A., Rendedal PR., and Svensson E. 2002, Prognostic significance of the circumferential resection margin following total mesorectal excision for rectal cancer. Br J Surgvol89:pp327–334.

[36]. World Health Organization Cancer Incidence in Five Continents. 2002, Lyon: The World Health Organization and The International Agency for Research on Cancer;.

[37]. Zhang XM., Zhang HL., and Yu D. 2008, 3-T MRI of rectal carcinoma: preoperative diagnosis, staging, and planning of sphincter-sparing surgery. AJR Am J Roentgenol ; 190:1271–8.