



Comparison of T and N Staging on Preoperative Magnetic Resonance Imaging and Postoperative Histopathologic Specimens in Rectum Cancer

Rektum Kanserlerinde Preoperatif Manyetik Rezonans Görüntüleme'deki T ve N Evrelemesinin Postoperatif Histopatolojik Evreleme ile Karşılaştırılması

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ABSTRACT

Aim: Preoperative magnetic resonance imaging (MRI) is one of the most common diagnostic methods in current rectal surgery. In this study, we planned to investigate the concordance between preoperative MRI findings and postoperative histopathological stage in patients with rectal cancer.

Method: Fifty-six patients who underwent rectal cancer surgery between September 2014-November 2016 in Adnan Menderes University Faculty of Medicine, Department of Surgery were included in the study. Preoperative and histopathological T and N stages were compared.

Results: Fifty-six patients were included in the study. Mean age was 66.05 (38-88) years. Tumor location was classified as lower rectum in 29.8%, mid-rectum in 32.3%, and upper rectum in 37.9% of the patients. While positive lymph nodes were found on MRI in 21 cases, only 15 were confirmed by histopathology. Of the 35 cases reported to be lymph node negative on MRI, 19 were confirmed. The sensitivity was 71.4% for positive lymph nodes and 54.3% for negative lymph nodes. As for T stages, there was a statistically significant association between MRI and pathological staging (p=0.049).

Conclusion: Although high-resolution MRI is currently one of the first imaging methods used in rectum cancers, additional imaging modalities should be also used there is any doubt about the diagnosis.

Keywords: Rectum cancer, magnetic resonance imaging, staging

ÖZ

Amaç: Günümüzde rektum cerrahisinde preoperatif dönemde manyetik rezonans görüntüleme (MRG) en çok kullanılan tanı yöntemlerinden birisidir. Çalışmamızda rektum kanserli hastalarda, MRG'nin preoperatif evrelemesi ile histopatolojik evrelemenin uyumunu araştırmayı planladık.

Yöntem: Adnan Menderes Üniversitesi Tıp Fakültesi, Genel Cerrahi Anabilim Dalı'nda Eylül 2014-Kasım 2016 tarihleri arasında rektum kanseri nedeniyle ameliyat edilmiş 56 hasta çalışmaya dahil edildi. T ve N değerleri preoperatif ve histopatolojik olarak karşılaştırıldı.

Bulgular: Çalışmaya 56 hasta alındı. Ortalama yaşı 66,05 (38-88) idi. Tümörlerin yerleşim yerine bakıldığında %29,8'i alt rektum, %32,3'ü orta rektum, %37,9'u ise üst rektum olarak gözlendi. MRG'de N(+) 21 olgu saptanırken bunlardan sadece 15'i patolojik olarak da N(+) olarak saptandı. MR'de 35 olgu N(-) saptanırken bunlardan 19'u patolojik olarak N(-) saptandı. N(+)'de duyarlılığı %71,4 iken, N(-)'lerde bu oran %54,3 olarak gözlendi. T değerlerine bakıldığında ise MR ile histopatolojik evreleme arasında istatistiksel bir anlamlılık olduğu gözlendi (p=0,049).

Sonuç: Günümüz rektum kanserlerinde preoperatif görüntüleme yöntemlerinden ilk başvurulacaklardan birisi yüksek çözünürlüklü MRG olmakla birlikte, tanıda kuşku duyulması halinde ek görüntüleme yöntemleri de mutlaka kullanılmalıdır.

Anahtar Kelimeler: Rektum kanseri, manyetik rezonans görüntüleme, evreleme



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Introduction

Rectal surgeries can be challenging due to the rectum being located in a narrow part of the pelvis. In addition, there are a variety of rectal surgeries ranging from local excision to pelvic exenteration. Therefore, preoperative evaluation of the rectum is very important.¹ Imaging techniques such as computed tomography (CT), magnetic resonance imaging (MRI), endorectal ultrasound (ERUS), and positron emission tomography can be used for selecting the correct surgical method and for tumor staging in the preoperative period. Many recent studies have compared ERUS and MRI in terms of sensitivity and specificity for the pelvic area evaluation. These studies have shown that MRI is advantageous in tumor staging, surgical planning, therapeutic decisions, assessing response to neoadjuvant chemotherapy, and detecting peritoneal implants and liver metastasis.² With this study, we aimed to evaluate agreement between preoperative T and N stages determined by preoperative MRI and histopathologic T and N stages in patients with rectal cancer.

Materials and Methods

The medical records of rectal cancer patients diagnosed and operated in the Adnan Menderes University Faculty of Medicine, Department of General Surgery between September 2014 and November 2016 were screened retrospectively. Patients with missing or incomplete medical records were excluded from the study. Staging was done according to the American Joint Committee on Cancer tumor-node metastasis staging.^{3,4} Patients with T3 and T4 positivity were treated with neoadjuvant therapy. T and N values obtained from MRI conducted after neoadjuvant chemotherapy were used in the data analysis to account for any stage changes due to the neoadjuvant therapy. MRI evaluations were conducted by a radiology specialist. Imaging of all patients was done at standard resolution (512 matrix) with Philips Achieva 1.5 Tesla® MR instrument.

Statistical Analysis

Data were analyzed using SPSS for Windows version 20.0 (IBM Corp., Armonk, NY, USA) statistics software. Variables were expressed as mean \pm standard deviation, median (minimum-maximum), percent, and frequency. In addition, the homogeneity of variance required for parametric tests was checked using Levene's test. Normality was assessed using the Shapiro-Wilk test. For comparisons of two groups, student's t-test was used when assumptions for parametric tests were met; otherwise, the Mann-Whitney U test was used. One-way ANOVA, followed by Tukey HSD post hoc test was used for comparisons of three or more groups. Kruskal-Wallis test followed by Bonferroni-Dunn post hoc test was used when the sample distribution was not normal.

Categorical data were analyzed using McNemar-Bowker test, Fisher's exact test, chi-square test, and sensitivity and specificity, positive predicted value, and negative predicted value were calculated. When the expected cell value was less than 20%, the Monte Carlo simulation method was used in order to be able to include these cells in the analysis. The relationship between two variables was assessed by Kendall rank correlation coefficient when the parametric test assumptions were not met. The level of significance was accepted as $p < 0.05$.

Results

A total of 56 patients with rectal cancer were included in the study. Thirty-two (57.1%) of the patients were male, 24 (42.9%) were female. Mean age was 66.05 years (range, 38-88 years). Tumors were located in the lower rectum in 29.8%, mid-rectum in 32.3%, and upper rectum in 37.9% of the cases. Mean tumor size was 4.39 cm (range, 0-13.5 cm). Radical resection (total mesorectal excision and abdominoperineal resection) was performed in all cases. Fourteen of the patients (25%) underwent laparoscopic surgery and 42 (75%) underwent conventional surgery. There was significant correlation between MRI and histopathologic evaluations for lymph node positive or negative results ($p = 0.048$). Although 21 patients were N(+) on MRI, only 15 patients were histopathologically N(+). Of the 35 patients evaluated as N(-) on MRI, 19 were determined N(-) in histopathologic examination. The sensitivity of MRI was 71.4% for N(+) and 54.3% for N(-) (Table 1, 2).

For T values, there was a significant association between MRI and histopathologic staging ($p = 0.049$). One case was T0 in both MRI and in histopathologic examination, yielding 100% agreement. Of the two cases evaluated as T1 on MRI, histopathologic results indicated only 1 as T1, for a 50% agreement rate. Of the 21 cases evaluated as T2 on MRI, only 10 were histopathologically T2, resulting in agreement of 47.6%. Of the 25 cases evaluated as T3 on MRI, 20 were confirmed T3 in histopathologic examination, for an 80% agreement rate. Six of the seven cases determined T4 on MRI were confirmed histopathologically T4, for 85.7% agreement (Table 3).

No significant associations were observed between radiologic and histopathologic tumor size and T value ($p = 0.46$), or between radiologic and histopathologic tumor size and N value ($p = 0.152$).

Discussion

Colorectal cancers are the third most common type of cancer worldwide, and account for 8% of all cancer-related deaths.⁵ The effective adjuvant and neoadjuvant treatment

protocols introduced in the last decade have facilitated better prevention of local and locoregional recurrence and thus improved survival.⁶ Early diagnosis and accurate preoperative staging are necessary to properly implement these protocols, and accurate radiologic imaging is essential for this. The detection rate of lymph node metastasis using ERUS, MRI, and CT for preoperative staging of rectal cancers is approximately 61-80%, 57-85%, and 56-79%, respectively.⁷ The latest guideline from the European Society of Medical Oncology reports that high-resolution MRI should be the first radiologic method used in evaluating the mesorectum in cases of rectal cancer.⁸ However, some

studies, including a meta-analysis by Al-Sukhni et al.,⁹ have demonstrated that MRI is not adequate on its own in terms of detecting lymph node metastasis in rectal cancer. We also found sensitivity rates of 71.4% for patients with N positivity and 54.3% for N-negative patients using MRI. False-positive lymph node metastasis results may result in the unnecessary administration of neoadjuvant therapy in patients who are actually lymph node negative. We believe one possible explanation for this was our lack of access to high-resolution MRI. Although detecting lymph node metastasis preoperatively with MRI can be difficult, lymph node findings like heterogeneity, morphologic changes, and increased diameter should arouse suspicion of metastasis.¹⁰ However, this does not apply to lymph nodes smaller than 4 mm, and this image quality is also possible with high-resolution MRI.¹¹ Despite the lack of high-resolution MRI in our center, our results for N positivity were consistent with the literature, while the rate of N negativity was lower than that in the literature concerning rectal cancer. We believe it is imperative in such suspicious cases to utilize additional methods such as ERUS.

Technological progress and the introduction of high-resolution MRI are believed to have solved a key step in the preoperative T staging of rectal cancer. Various authors have reported MRI T-staging accuracy rates between 44 and 100%.^{12,13,14} In the present study, there was 100% accuracy for the one patient who was T0, whereas the agreement rates between MRI and histopathologic staging were 50% for T1, 47.6% for T2, 80% for T3, and 85.7% for T4 cases. Statistical analysis was not possible for T0 due to there being only one patient. However, for the other stages, the T3 and T4 groups showed the highest MRI/histopathology agreement, while we were detecting early stage cancers was unsuccessful. Lu et al.¹⁵ found it most difficult to distinguish T2 and T3 tumors using MRI and reported that high-resolution MRI may facilitate their differentiation. The T-staging accuracy rate of ERUS in rectal cancers has been reported as approximately 69%.¹⁶ Therefore, in centers without high-resolution MRI,

Table 1. Radiologic and pathologic tumor staging distribution of colorectal cancer patients

		n	%
Sex	Male	32	57.1
	Female	24	42.9
Radiologic T	T0	1	1.8
	T1	2	3.6
	T2	21	37.5
	T3	25	44.6
	T4	7	12.5
Radiologic N	N(-)	35	62.5
	N(+)	21	37.5
Pathologic N	N(-)	25	44.6
	N(+)	31	55.4
Pathologic T	T0	1	1.8
	T1	1	1.8
	T2	15	26.8
	T3	32	57.1
	T4	7	12.5
	Total	56	100.0

Table 2. Comparison of lymph node results from magnetic resonance imaging and histopathologic examination

		n	Pathologic N		Total	Fisher's exact test	p
			N(-)	N(+)			
Radiologic N	N(-)	n	19	16	35	3.872	0.048*
		%	54.3%	45.7%	100.0%		
	N(+)	n	6	15	21		
		%	28.6%	71.4%	100.0%		
Total	n	25	31	56			
	%	44.6%	55.4%	100.0%			

*p<0.05

Table 3. Comparison of magnetic resonance imaging and histopathologic T staging

			Pathologic T					Total	McNemar-Bowker test	p
			T0	T1	T2	T2	T4			
Radiologic T	T0	n	1	0	0	0	0	1	4.267	0.049*
		%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%		
	T1	n	0	1	1	0	0	2		
		%	0.0%	50.0%	50.0%	0.0%	0.0%	100.0%		
	T2	n	0	0	10	11	0	21		
		%	0.0%	0.0%	47.6%	52.4%	0.0%	100.0%		
	T3	n	0	0	4	20	1	25		
		%	0.0%	0.0%	16.0%	80.0%	4.0%	100.0%		
	T4	n	0	0	0	1	6	7		
		%	0.0%	0.0%	0.0%	14.3%	85.7%	100.0%		
	Total	n	1	1	15	32	7	56		
		%	1.8%	1.8%	26.8%	57.1%	12.5%	100.0%		

*p<0.05

we recommend performing ERUS examination if possible for patients suspected of not being staged properly.

We observed no significant relationship between the tumor's size and their radiologic or histopathologic T and N stages. This may be due to tumor differentiation and degree of invasion. In a study of 439 colorectal cancer patients, Balta et al.¹⁷ demonstrated that horizontal tumor diameter was significantly associated with extent of invasion and could be used in predicting prognosis. Because the present study included only rectal cancer patients and the patient number was smaller, we were unable to show this relationship statistically.

In brief, MRI and ERUS are radiologic imaging methods currently used preoperatively in the management of rectal cancer. Although neither is clearly superior, ERUS has limited use in cases of upper-rectal and obstructive tumors, and high-resolution MRI is recommended as a first-line imaging method due to its many advantages. In uncertain cases, ERUS should definitely be utilized in addition to MRI. Randomized, prospective studies are required to more accurately interpret our results and add value to our retrospective study. The retrospective design and especially the small patient number are the main factors which limit our ability to interpret this study. Furthermore, we believe studies evaluating both MRI and ERUS as opposed to MRI alone would be more elucidating. Another limitation is the presence of standard-resolution MRI in our medical center; access to high-resolution MRI would allow more accurate conclusions.

Ethics

Ethics Committee Approval: No ethics committee was approved for a retrospective study, Informed Consent: Consent form was filled out by all participants.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Eyüp Murat Yılmaz, Erdem Barış Cartı, Mustafa Gök, Concept: Eyüp Murat Yılmaz, Hedef Özgün, Design: Eyüp Murat Yılmaz, Hedef Özgün, Data Collection or Processing: Eyüp Murat Yılmaz, Mustafa Gök, Analysis or Interpretation: Eyüp Murat Yılmaz, Hedef Özgün, Literature Search: Eyüp Murat Yılmaz, Hedef Özgün, Writing: Eyüp Murat Yılmaz.

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