MRI provides higher rate of accuracy for determination of myometrial invasion of superficial type in patients with endometrial cancer

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Abstract

Aim: We aimed to evaluate the sensitivity of MRI in endometrial cancer by comparing the rate of myometrial invasion of preoperative MRI with the myometrial invasion rates of postoperative histopathological assessment.

Materials and Methods: This retrospective study analyzed the medical records of 32 patients diagnosed with endometrial cancer in our hospital's obstetrics and gynecology clinic from January 2000 to August 2017. Baseline clinical characteristics such as age, gravidity, parity, comorbidities as well as MRI and pathology results were recorded and analyzed.

Results: The patients with endometrial cancer had a median age of 57 (36-79) years. Our findings revealed that MRI demonstrated an accuracy of %75 for myometrial invasion with 96% sensitivity, 66% specificity, 96% positive predictive value, and 66% negative predictive value.

Conclusion: Overall, the current results supports that the accuracy of MRI for the determination of severity of myometrial invasion in patients with endometrial cancer is the highest when the myometrial invasion is superficial in histopathological examination; however, its accuracy is somewhat lower when there is no or deep myometrial invasion in histopathological examination.

Introduction

Endometrial carcinoma ranks among the prevalent malignancies of the female reproductive system [1, 2]. According to studies conducted in the United States, endometrial cancer is diagnosed at an average age of 62 years [3, 4]. The most common but non-pathognomonic symptom of the disease is abnormal uterine bleeding. Histopathological findings from endometrial sampling play a pivotal role in the diagnosis of endometrial cancer [5]. The disease stage is the most important prognostic factor for endometrial cancer [6]. However, tumor size, patient age, extrauterine spread, surgical and clinical findings, hormone receptor status, and DNA ploidy are all important factors in prognosis [7-9].

Ultrasonography is the preferred initial imaging modality for evaluating the endometrium [10]. Transvaginal ultrasonography (TV-US) is useful in demonstrating the presence of endometrial thickening, but is incomplete in determining the extent of myometrial invasion (MI) [11, 12]. Contrast-enhanced computed tomography (CT) is more commonly used in advanced stage disease and has limitations in assessing MI and cervical involvement [13]. Magnetic resonance imaging (MRI) serves as a standard imaging protocol extensively employed in the staging of endometrial cancer. Numerous articles have extensively explored the accuracy of MRI in local staging as well [14-18]. High contrast resolution MRI has been demonstrated to be the best imaging modality for preoperative evaluation of endometrial cancer. Conventional MRI can evaluate the anatomy of the uterine and cervical region and pathologies in this region can be differentiated especially on T2-weighted (T2A) imaging [19].

The primary treatment for endometrial cancer is surgery [20]. In endometrial cancer, treatment protocols vary according to the depth of the tumor's MI. Intraoperative

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determination of the depth of MI is made by macroscopic evaluation of the removed uterine cross-sectional surface or histologic examination of frozen sections. The extent of surgical treatment is decided based on the depth of MI at the time of surgery. In the presence of deep MI, patients require pelvic and para-aortic lymph node dissection [21]. In patients with deep MI, chemotherapy and radiation therapy may be required. Patients under the age of 40 or those diagnosed during the premenopausal period may require fertility preservation interventions. High-dose medroxyprogesterone acetate hormone therapy is employed in the conservative management of endometrial carcinoma. When deciding on fertility preservation treatment, the absence of MI should be demonstrated. This emphasizes the significance of determining the presence of invasion [22]. Postoperative histopathological examinations determine the exact depth of tumor invasion. Preoperative evaluation of cases using non-invasive imaging methods is critical for treatment planning [23].

The objective of this study was to evaluate the sensitivity of MRI in endometrial cancer by comparing the rate of MI of preoperative MRI with the MI rates of postoperative histopathological assessment.

Materials and Methods

In this study, including woman with endometrial cancer undergone surgical management, we evaluated the sensitivity of MRI performed preoperatively in woman with endometrial cancer for the detection of MI. Diagnosis of MI was reached after the histological examination by light microscopy. Before starting this study, the approval was obtained from our institution's Human Research Ethics Committee (Bakirkoy Dr. Sadi Konuk Training and Research Hospital Clinical Research Ethics Committee, Dated: October 09, 2017, Registered: 2017/294).

The retrospective study encompassed the medical records of 32 patients diagnosed with endometrial cancer, who had undergone surgical procedures at our hospital's obstetrics and gynecology clinic from January 2000 to August 2017. Exclusion criteria comprised cases with a prior history of malignancy, endometriosis, or pelvic infection. The demographic data, presence of comorbid diseases, histopathological and MRI findings were obtained from patient files. In the study, we divided the patients into three groups: patients with no, superficial, and deep MI by histopathological examination.

Statistical analysis

IBM Statistical Package for Social Sciences (SPSS) version 22.0 for Windows (IBM SPSS, USA) was employed for statistical analysis. Descriptive statistical analysis was utilized to calculate mean values with standard deviations, while the chi-square test was employed for comparing MRI results. A significance level of $p < 0.05$ was considered for all analyses.

Results

We analyzed MI related data of all the participants. The patients in the study had a median age of 57 (36-79) years. While 22% of the patient population was premenopausal,

Table 1. Comparison of MRI findings regarding histopathology in the detection of myometrial invasion in patients with endometrial cancer.

MRI	Histopathology			
	NMI	SMI	DMI	Total
NMI	2	1	0	3
SMI	1	16	5	22
DMI	0	1	6	7
Total	3	18	11	32

NMI: No myometrial invasion, SMI: Superficial myometrial invasion (<50%), DMI: Deep myometrial invasion (>50%).

78% was postmenopausal. Of these patients, 5 were nulliparous and 27 were multiparous. Of the patients analyzed, 14 had no comorbid disease, 15 had hypertension, 9 had diabetes mellitus, 7 had goiter and 2 had asthma.

Twenty eight patients (87.5%) were diagnosed with endometrioid adenocarcinoma, 1 patient (3.1%) was diagnosed with clear cell carcinoma, 1 patient (3.1%) was diagnosed with carcinosarcoma, and 2 patients (6.3%) were diagnosed with serous papillary carcinoma histopathologically. Comparison of MRI and histopathological results of endometrial carcinoma is analyzed in Table 1. There was no MI in 9.4% of patients, there was less than 50% MI in 68.8% of patients, and there was more than 50% MI in 21.9% of patients according to preoperative MRI. According to postoperative histopathological results, 9.4% of patients have no MI, 59.4% of patients have less than 50% MI, and 31.3% of patients have more than 50% MI.

When preoperative MI was compared with postoperative MI, MRI accuracy was 75%, specificity 66%, sensitivity 96%, negative predictive value 66%, and positive predictive value 96%.

The success rate of MRI in assessing the severity of myometrial invasion (MI) in endometrial cancer patients is notably highest for those with superficial MI ($p < 0.05$), whereas this correlation is not observed for patients

Discussion

Tumor stage, grade and MI are important prognostic factors in endometrial cancer. The prognostic factors are directly related to 5-year survival, risk of lymph node metastasis and recurrence [9, 24]. In a study, no pelvic or para-aortic lymph node involvement was observed in histologic grade 1 endometrial cancer cases without MI. However, in grade 1 patients with inner 1/3 MI, pelvic lymph node involvement was observed in 3% and para-aortic lymph node involvement in 1%. In cases with grade 3 external MI, the rate of pelvic lymph node involvement was 34%, whereas for para-aortic lymph nodes this rate could be as high as 24% [25]. As a result of inaccurate assessment of recurrence risk factors such as tumor stage and histological type by preoperative MRI and intraoperative frozen section analysis, inappropriate surgery may be performed. This has a negative impact on patients' long-term quality of life. Moreover, preoperative knowledge of the depth of MI will facilitate the introduction of minimally invasive therapy for early-stage disease. When there is no MI,

women who want to keep their childbearing ability may opt for hormone therapy.

In their study, Sironi et al. [24] categorized the cases into three distinct groups based on the extent of invasion: tumors with no invasion, tumors with superficial MI, and tumors with deep MI. The researchers discovered that MRI exhibited a sensitivity of 71.4% in T2-weighted images for accurately determining the depth of MI.

In a study on MI [26], researchers divided their cases into early stage tumors without deep MI and tumors with deep MI and reported MRI sensitivity of 92% for T2-weighted images. However, in studies like the present study in which the depth of invasion is classified into two groups, non-invasive tumors and tumors with superficial invasion are evaluated in the same group, thus the value of examining the junctional zone, which is difficult to monitor especially after menopause, is lost. As a result, the accuracy of MRI is improved.

Saez F et al. [27] conducted a comprehensive study focusing on the assessment of deep MI, demonstrating that dynamic contrast-enhanced MRI emerges as the preferred imaging modality for predicting this condition with remarkable accuracy. The study revealed a sensitivity ranging from 72% to 94% and a specificity ranging from 87% to 96%, underscoring the reliability and precision of dynamic contrast-enhanced MRI in detecting deep MI.

In their study, Chen et al.[28] divided MI cases into two groups as deep (more than 50%) and shallow (less than 50%) MI according to MRI and pathology results. They found 84.78% accuracy, 66.67% sensitivity, 87.50% specificity, 44.44% positive predictive value, and 94.59% negative predictive value in the detection of deep MI.

In a meta-analysis, MRI demonstrated a notable specificity in detecting cervical invasion and lymph node metastases in endometrial cancer, along with a favorable diagnostic performance in identifying deep MI. Notably, patients below the age of 60 exhibited heightened sensitivity and specificity in detecting deep MI [29].

In our study, we conducted a comprehensive comparison between the MI depth findings obtained through preoperative MRI and the subsequent postoperative histopathological examinations. The results of our meticulous analysis revealed an accuracy rate of 75% and an impressive sensitivity rate of 96% for determining MI depth using MRI. These findings are consistent with the outcomes reported in other relevant studies, further substantiating the reliability and validity of MRI as a diagnostic tool for assessing MI depth.

Nevertheless, our study does have certain limitations. Firstly, its retrospective nature should be acknowledged. Secondly, while the number of cases included in our study may appear modest, it is important to highlight that we actually had a substantial number of cases in comparison to similar studies documented in the literature. Additionally, a noteworthy strength of our study lies in the meticulous evaluation of all cases by experienced physicians exclusively within a single institution.

Conclusion
MRI is an increasingly widespread imaging modality used in the preoperative staging of endometrial cancer all over the world and is of utmost importance in the decision of the surgical method. Dynamic imaging is preferred in endometrial cancer because it shows the contrast uptake pattern of the tumor. Overall, the current results supports that the accuracy of MRI for the determination of severity of MI in patients with endometrial cancer is the highest when the MI is superficial in histopathological examination; however, its accuracy is somewhat lower when there is no or deep MI in histopathological examination.

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