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Magnetic Resonance Imaging (MRI) Staging in Women with Endometrial Cancer: A Correlation with Histopathology

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ABSTRACT

Background & Objective: Endometrial cancer is the most frequent genitourinary tract malignancy in women. Women with endometrial cancer mostly refer at early stages of the disease which leads to good prognosis. Magnetic resonance imaging (MRI) has a crucial role in staging of the cancer. As there are little studies regarding the correlation between histopathology and International Federation of Gynecology and Obstetrics (FIGO) staging in Iranian women with endometrial cancer, we designed this study to assess the relationship between histopathology and FIGO staging with MRI in Iranian women with endometrial cancer.

Materials & Methods: This retrospective study was conducted in Imam Khomeini hospital complex between January 2015 and January 2018. All MRIs were performed on a 3T system. All imaging was done in Imam Hospital under observation of attending Radiologists with 10 and 20 years of work experience in women's imaging who conducted this research. Obtained surgical specimens were assessed by an expert pathologist in the field of cancer and type of cancers were determined.

Results: Thirty-two women with proved endometrial cancer (D&C or endometrial biopsy) were enrolled. Mean age was 55.2±10.7 years and all women referred Imam Hospital with vaginal bleeding. The most common FIGO staging was IA (14, 43.75%) and the most frequent pathology was endometrioid type adenocarcinoma (30, 93.7%) (60% well differentiated, 13.3% moderately differentiated, and 26.6% poorly differentiated). Most cases with endometrioid type poorly differentiated referred with IIIC1 stage of cancer, most patients with endometrioid type well differentiated referred with stage IA, a patient with clear cell cancer referred with stage IIIB, and patients with sarcoma referred with stages IB, and IV.

Conclusion: Patients with poor differentiated endometrial cancer referred with higher stages of the cancer.

Keywords: Endometrial cancer, Magnetic resonance imaging, Staging

Introduction

Endometrial cancer is the most frequent genitourinary tract malignancy in women which accounts the sixth malignancy in females and is the cause of death in near 90000 in 2018 (1). The incidence of the cancer is two-fold in Caucasians compared to African Americans (2). Advanced age, obesity, diabetes mellitus, nulliparity, estrogen therapy, tamoxifen regimen, physical inactivity and hypertension are among common risk factors (3,4).

The histopathological classification is made, based on microscopic features.

According to WHO, endometrial cancer classification is as following (5):

Endometrioid adenocarcinoma, usual type
• Endometrioid adenocarcinoma, variant types
− With squamous differentiation
− With secretory differentiation
− Villoglandular
− With mucinous differentiation
− Ciliated cell type
• Mucinous carcinoma
Serous endometrial intraepithelial carcinoma
• Serous adenocarcinoma
• Clear cell adenocarcinoma
• Neuroendocrine carcinoma
− Low-grade neuroendocrine tumor/carcinoid tumor
− High-grade neuroendocrine carcinoma
• Small cell neuroendocrine carcinoma
• Large cell neuroendocrine carcinoma
• Mixed carcinomas
• Undifferentiated carcinoma
• Dedifferentiated carcinoma

Nowadays, based on clinic-pathological and molecular parameters, two types of endometrial carcinomas are introduced. Type I, consists of 80-90% of all endometrial cancers, which is a low stage at diagnosis with satisfactory clinical progression **(6)**. It mostly occurs in peri- and postmenopausal period **(6)**. Histologically, they are endometrioid type of endometrial adenocarcinomas (grade 1 and 2) and mucinous carcinomas **(6)**.

Type II carcinomas are high grade at diagnosis with poor outcome and histologic compatible with serous carcinoma as well as clear cell, undifferentiated carcinomas and a group of endometrioid type of endometrial adenocarcinomas (grade 3) **(6)**.

International Federation of Gynecology and Obstetrics (FIGO) staging system is used worldwide for endometrial cancer staging which was revised in 2009 **(7)** and is useful for clinical management. As the primary treatment of endometrial cancer is hysterectomy which is based on surgery and histology **(8)** accurate FIGO staging could be helpful.

By means of FIGO staging, myometrial and uterine serosa invasion, adenexal involvement, cytology of peritoneum, and lymph node involvements should be considered **(9)** which are used for prognosis determination **(10)**.

Magnetic Resonance Imaging (MRI) can be used as the sole diagnostic method of evaluation before surgical interventions with accuracy reported between 83-92% **(11, 12)**. Myometrial invasion, cervical, vaginal and nodal involvement could be assessed which will help treatment option selection.

As there are little studies regarding the correlation between histopathology and FIGO staging in Iranian women with endometrial cancer, we designed this study to assess the relationship between histopathology on FIGO staging of endometrial cancer in Iranian women.

Materials and Methods

This retrospective study was conducted in Imam Khomeini hospital complex affiliated hospital with Tehran University of medical sciences (TUMS) between January 2015 and January 2018.

Inclusion criteria were: confirmed endometrial cancer diagnosis based on D&C or endometrial biopsy.

All MRIs were performed on a 3T system (Siemens MAGNETOM TRIO, ATim system 3T eco) which has a six-channel body coil. The gradient strength is 45mTper meter. The patients were placed in supine position and the head was pointing toward the magnet, the spine coils were placed and body coils were placed over abdomen and pelvic. The body coils were tightened to prevent respiratory artifacts. We put the laser beam localizer over the iliac crest and registered the cases in the system. T 1-weighted turbo spin-echo images were obtained in axial plane (FOV:300×220 MM, TE: 12 ms, TR:800 ms, slice thickness 3 mm, slice gap: 1 mm, matrix:256×186).

T2-weighted turbo-spin echo were achieved in sagittal and oblique axial planes FOV:220×165 MM, TE: 101 ms, TR:5000 ms, slice thickness 3 mm, slice gap: 0.3 mm, matrix:256×186), oblique coronal plane (FOV:240×240, matrix:320×310).

The oblique, axial and coronal planes were placed in relation to the minor/major axis of the uterine body

orthogonal with endometrial line. Diffusion-weighted images were obtained with echo-planner technique with body background suppression (FOV:350×265 mm, TE:85 ms, TR:6100 ms, slice thickness:4 mm, b value of 50, 400 ,1000). Contrast-enahnced fat-suppressed T1-weighted imaging sagittal images were aslso performed by the following characteristics: (FOV:320×240MM, TE:2.1 ms; slice thickness: 3 mm, TR:4.3, matrix: 265×196, dynamic techniques in phases including 30, 90, 180 second), axial : (FOV:300×220 mm, TE:1.5 ms, TR:2.59 ms, slice thickness: 3mm, matrix: 256×192, dynamic technique in phase including 4 Minute).

We staged our cases by FIGO staging. The reference standard was the revised FIGO staging system (2009) **(13)**. Obtained surgical specimens were assessed by an expert pathologist in the field of cancer and type of cancers were determined.

SPSS version 24 (SPSS Inc., Chicago, IL., USA) was used for data analysis. Data was shown in mean ± SD for continuous and frequencies for categorical variables.

Results

Thirty-two women were enrolled. Mean age was 55.2±10.7 years and all women referred to Imam Hospital with vaginal bleeding.

The most common FIGO staging was IA (14, 43, 7%) and the most frequent pathology was endometroid type adenocarcinoma (93.7%) (Table 1).

Most cases with endometroid type poorly differentiated referred with IIIC1 stage of cancer, most patients with endometroid type well differentiated referred with stage IA, and patients with sarcoma referred with stages IB, and IV (Table2 and 3).

Table 1. Frequency of FIGO staging and pathology in all recruited cases

FIGO staging	Frequency (%)
IA	14(43.7%)
IB	5(15.6%)
II	2(6.25%)
IIIA	-
IIIB	-
IIIC1	8(25.0%)
IIIC2	2(6.25%)
IV	1(3.1%)
Pathology	Frequency (%)
Endometroid adenocarcinoma	30(93.7%)
Poor differentiated	8(26.6%)
Moderately differentiated	4(13.3%)
Well differentiated	18(60%)
Sarcoma	2(6.3%)

Table 2. Pathology findings and staging of the cancer

Stage	Endometroid type poor differentiated	Endometroid type well differentiated	Endometroid type moderately differentiated	Sarcoma	P-value
IA	1(3.125%)	12(37.5%)	1(3.125%)	0	
IB	0	3(9.4%)	1(3.125%)	1(3.125%)	
II	2(6.25%)	0	0	0	
IIIA	0	0	0	0	**<0.001**
IIIB	0	0	0	0	
IIIC1	4(12.5%)	3(9.4%)	1(3.125%)	0	
IIIC2	1(3.125%)	0	1(3.125%)		
IV A	0	0	0	1(3.125%)	

Table 3. FIGO staging and types of the cancer

Staging	Type I N=22	Type II N=15	P-value
IA	12(60%)	5(29.4%)	0.3
IB	3(15%)	2(11.8%)	
II	1(4.5%)	2(11.8%)	
IIIA	0	1(5.9%)	
IIIB	0	1(5.9%)	
IIIC1	4(20%)	4(23.5%)	
IIIC2	1(5%)	1(5.9%)	
IV	0	1(5.9%)	

Discussion

The result of current study showed that poorly differentiated endometroid type cancers refer to the physicians in higher stages while well-differentiated cases refer with lower stages. The results also showed that patients with sarcomas refer with higher stage of the cancer. We also found that most common type of the cancer was endometroid adenocarcinoma and more than half of patients referred with lower stages (IA, IB).

In a previous study which was conducted by Tanaka *et al.*, the most common stage of endometrial cancer was IA followed by IB **(14)** and in Zamani *et al.* study the most frequent type of cancer was endometroid type **(15)** which is in line with our results.

Uterine sarcomas consisted of 8% of uterine malignancies which present as pelvic masses, vaginal bleeding and abdominopelvic pain **(16)**. Our results showed that patients with uterine sarcoma refer with different staging's (IA, IB, IV).

Endometrial cancer mostly presents at early stages which has good prognosis **(17)**. Between 3 and 13% of endometrial cancers invade other organs or extent outside the uterus **(17)**. Survival of patients with stage IV is estimated to be 10-20% **(17)**. Near 80% of endometrial cancers are adenocarcinomas of which 60–65% of them are endometrioid cancers **(17)**. Endometroid type-cancers could be well differentiated (grade1), moderately differentiated (grade2) and poorly differentiated (grade3) **(9)**.

Endometrial cancer could be regarded as type I and type II. Type I represents 75% of all endometrial cancers and endometrioid is the most common histology while clear cell and papillary serous are considered as subgroups of type II cancers **(17)**. Type II cancers arise in post-menopausal women and have poorer prognosis.

The preoperative assessment includes MRI which provides information regarding myometrial invasion, cervical, vaginal and nodal involvement **(9)**. MRI will help to determine the plan of treatment.

Obesity is a risk factor for endometrial cancer through different pathways such as insulin resistance, hyperglycaemia and hyperinsulinaemia which leads to increase of bioavailability of insulin growth factor (IGF) **(17,18)**. IGF promotes endometrial proliferation and finally, endometrial cancer development. Estrogen exposure could be exogenous (hormone replacement therapy) or endogenous (excessive obesity and anovulation) **(17)**. The treatment includes surgery, adjuvant radiotherapy, hormonal and target agent therapy **(9)**.

This study had some limitations. First, it was conducted in a tertiary center. Second, the sample size was limited. Larger multi-centric studies are recommended.

Conclusion

Patients with poor differentiated endometrial cancer referred with higher stages. FIGO staging of endometrial cancer by MRI with superior soft tissue resolution is well correlated with histopathology of endometrial cancer. In current study the patients with type I endometrial cancer (mainly well differentiated endometroid type) referred at lower stages, while the patients with type II (mainly poor differentiated type) referred at higher stages.

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Conflict of Interest

Authors declared no conflict of interests.

References

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A Cancer J Clinic. 2018;68(6):394-424. [DOI:10.3322/caac.21492] [PMID]

2. Allard JE, Maxwell GL. Race disparities between black and white women in the incidence, treatment, and prognosis of endometrial cancer. Cancer Control. 2009;16(1):53-6. [DOI:10.1177/107327480901600108] [PMID]
3. Aryan A, Askari F, Mohammadifar M, Ghajarzadeh M. Role of MRI (Magnetic Resonance Imaging) in Preoperative Staging of Endometrial Cancer: A Review. Austin J Radiol. 2016;3(1):1045.
4. Voskuil DW, Monninkhof EM, Elias SG, Vlems FA, van Leeuwen FE. Physical activity and endometrial cancer risk, a systematic review of current evidence. Cancer Epidemiol Prevent Biomark. 2007;16(4):639-48. [DOI:10.1158/1055-9965.EPI-06-0742] [PMID]
5. Carcangiu ML eaeTotfroIKP, Sobin, LH eWccotIL.
6. Lax SF. Pathology of Endometrial Carcinoma. Advances in experimental medicine and biology. 2017;943:75-96. [DOI:10.1007/978-3-319-43139-0_3] [PMID]
7. Sheets: NCICSF, sorpus and uterus NB, Md: National, Cancer Institute.
8. Freeman SJ, Aly AM, Kataoka MY, Addley HC, Reinhold C, Sala E. The revised FIGO staging system for uterine malignancies: implications for MR imaging. Radiographics. 2012;32(6):1805-27. [DOI:10.1148/rg.326125519] [PMID]
9. Arian A, Ghanbari Z, Deldar Pasikhani M, Eftekhar T, Gity M, Shakiba M, Sabetrasekh P, Setayeshpour B, Alipour A. Agreement of manual exam (POP-Q) with pelvic MRI in assessment of anterior pelvic organ prolapse. Iran J Radiol. 2017 Oct 1;14(4):e38542. [DOI:10.5812/iranjradiol.38542]
10. Amant F, Moerman P, Neven P, Timmerman D, Van Limbergen E, Vergote I. Endometrial cancer. The Lancet. 2005;366(9484):491-505. [DOI:10.1016/S0140-6736(05)67063-8]
11. Lien H, Blomlie V, Trope C, Kaern J, Abeler V. Cancer of the endometrium: value of MR imaging in determining depth of invasion into the myometrium. AJR American journal of roentgenology. 1991;157(6):1221-3. [DOI:10.2214/ajr.157.6.1950869] [PMID]
12. Marti-Bonmati L, Graells M, Ronchera-Oms C. Reduction of peristaltic artifacts on magnetic resonance imaging of the abdomen: a comparative evaluation of three drugs. Abdominal Imaging. 1996;21(4):309-13. [DOI:10.1007/s002619900070] [PMID]
13. Pecorelli S. Revised FIGO staging for carcinoma of the vulva, cervix, and endometrium. No longer published by Elsevier; 2009. [DOI:10.1016/j.ijgo.2009.02.012] [PMID]
14. Tanaka T, Terai Y, Ono YJ, Fujiwara S, Tanaka Y, Sasaki H, et al. Preoperative MRI and intraoperative frozen section diagnosis of myometrial invasion in patients with endometrial cancer. Int J Gynecol Cancer. 2015;25(5):879-83. [DOI:10.1097/IGC.0000000000000470] [PMID]
15. Zamani F, Goodarzi S, Hallaji F, Zamiri A, Deilami T, Malek M, et al. Diagnostic value of pelvic MRI for assessment of the depth of myometrial invasion and cervical involvement in endometrial cancer: comparison of new versus old FIGO staging. Iran J Radiol. 2012;9(4):202. [DOI:10.5812/iranjradiol.5276] [PMID] [PMCID]
16. Wu T-I, Yen T-C, Lai C-H. Clinical presentation and diagnosis of uterine sarcoma, including imaging. Best Practice Res Clin Obstet Gynaecol. 2011;25(6):681-9. [DOI:10.1016/j.bpobgyn.2011.07.002] [PMID]
17. Vitale SG, Valenti G, Gulino FA, Cignini P, Biondi A. Surgical treatment of high stage endometrial cancer: current perspectives. Updates Surg. 2016;68(2):149-54. [DOI:10.1007/s13304-015-0340-1] [PMID]
18. Schmandt RE, Iglesias DA, Co NN, Lu KH. Understanding obesity and endometrial cancer risk: opportunities for prevention. Am J Obstet Gynecol. 2011 Dec 1;205(6):518-25. [DOI:10.1016/j.ajog.2011.05.042] [PMID] [PMCID]

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