Comparing the efficacy of imaging techniques in detecting myometrial invasion, cervical involvement and pelvic lymph-nodal metastasis in endometrial cancer

Endometriyal kanserde myometrial invazyon, servikal invazyon ve pelvik lenf nodu metastazını belirlemede görüntüleme tekniklerinin etkinliğinin karşılaştırılması

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ABSTRACT

Aim: To compare sensitivity, specificity, positive predictive and negative predictive value of preoperative imaging techniques for detecting myometrial invasion, cervix involvement, and also pelvic lymph nodal metastasis in endometrial cancer

Materials and Methods: The medical records of patients who underwent an operation for endometrial cancer in the years between 2005 and 2017 were collected from the database at our institution.

Preoperative imaging reports of 252 ultrasonography (USG), 89 computerized tomographies (CT), 147 magnetic resonance imaging (MRI) of patients with endometrial cancer, and postoperative pathologic reports were collected and compared.

Results: In our study 252 ultrasonography (USG), 89 computerized tomography (CT), 147 magnetic resonance imaging (MRI) examinations were evaluated. Among deep myometrial invasion; all imaging modalities have low specificities (respectively 26.7%, 37.9%, and 32.4%) but higher sensitivities (respectively 68.5%, 79.1%, and 89.4%). To rule out cervical invasion all modalities have high and comparable sensitivities (respectively 98.3%, 95.0%, and 87.0%). On the other hand, USG has superiority to detect cervical invasion over CT and MRI (respectively 71.4%, 15.4%, and 22.7%). CT has much higher sensitivity than MRI for detection of pelvic lymph node metastasis (87.5% vs 53.1%).

Conclusion: Preoperative imaging modalities have high sensitivities for deep myometrial invasion, but low detection rates for cervical involvement and pelvic lymph node metastasis. MRI should be the preferred modality for myometrial invasion, on the other hand, The USG is much better to detect cervical involvement. CT has superiority on other imaging modalities among lymph node metastasis.

Keywords: Endometrial cancer; imaging techniques; staging; MRI; CT; USG.

ÖZ

Amaç: Endometriyal kanserde miyometrial invazyon, serviks tutulumu ve ayrıca pelvik lenf nodu metastazını saptamak için preoperatif görüntüleme tekniklerinin duyarlılık, özgüllük, pozitif prediktif ve negatif prediktif değerini karşılaştırmaktır.

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Gereç ve Yöntem: *2005-2017 yılları arasında endometrium kanseri nedeniyle ameliyat olan hastaların tıbbi kayıtları kurumumuzun veri tabanından toplanmıştır. Endometrium kanserli hastaların 252 ultrasonografisi (USG), 89 bilgisayarlı tomografisi (BT), 147 manyetik rezonans görüntülemesi (MRG) ve ameliyat sonrası patolojik raporları toplandı ve karşılaştırıldı.*

Bulgular: *Çalışmamızda 252 ultrasonografi (USG), 89 bilgisayarlı tomografi (BT), 147 manyetik rezonans görüntüleme (MRG) incelemeleri değerlendirildi. Derin myometrial invazyon arasında; tüm görüntüleme yöntemlerinin özgüllüğü düşük (sırasıyla %26,7, %37,9, %32,4) ancak daha yüksek duyarlılıkları (sırasıyla %68,5, %79,1, %89,4) vardır. Servikal invazyonu dışlamak için tüm modaliteler yüksek ve karşılaştırılabilir hassasiyetlere sahiptir (sırasıyla %98,3, %95,0, %87,0). USG ise BT ve MRG'ye göre servikal invazyonu saptamada üstünlüğe sahiptir (sırasıyla %71,4, %15,4, %22,7). BT, pelvik lenf nodu metastazının saptanması için MRG'den çok daha yüksek duyarlılığa sahiptir (%87,5'e karşı %53,1).*

Sonuç: *Preoperatif görüntüleme yöntemleri, derin myometrial invazyon için yüksek hassasiyete sahiptir, ancak servikal tutulum ve pelvik lenf nodu metastazı için düşük tespit oranlarına sahiptir. Myometrial invazyon için MRG tercih edilmelidir, öte yandan USG servikal tutulumu saptamak için çok daha iyidir. BT'nin lenf nodu metastazları arasında diğer görüntüleme yöntemlerine üstünlüğü vardır.*

Anahtar Sözcükler: *Endometrial kanser, görüntüleme teknikleri, ultrason, manyetik rezonans görüntüleme, bilgisayarlı tomografi.*

INTRODUCTION

The treatment modality in endometrial cancers based on surgical pathological staging. The depth of myometrial invasion (MI) and cervical involvement as intrauterine factors and lymph node metastasis as an extra uterine factor have an important impact on the treatment and prognosis of endometrial carcinoma (1-5). Although evaluation with transvaginal USG is the initial step for radiologic imaging, it has limited value to detect extra uterine spread. On the other hand, it has comparable detection rates with MRI for intrauterine spread such as myometrial invasion and cervical involvement. CT is a valuable technique for the distant spread of the disease. MRI has been shown superiority on CT to detect the local spread of the disease. Besides imaging modalities, the intraoperative frozen section has an important role to determine the myometrial invasion and cervical involvement. However, it may not be available in all surgical centers.

Radical surgery may not be required in low-risk patients who have no evidence of intrauterine or extra uterine involvement with preoperative imaging techniques. Thus, evaluation of intrauterine or extra uterine dissemination with preoperative imaging techniques and laboratory becomes more important especially in elderly patients with the additional disease who are avoided radical surgery.

In our study, we searched for the potentials of the preoperative imaging techniques to predict the high-risk intrauterine pathological factors such as depth of MI, cervical involvement, and besides pelvic lymph nodal metastasis.

MATERIALS and METHODS

The hospital records of 455 patients undergoing staging surgery for the diagnosis of endometrial cancer between 1 January 2005 and 31 December 2017 were reviewed in this retrospective study. Ethics committee approval was obtained from our institution before the study started (#2019-5/10).

The study included patients whose final pathology was representative of endometrial cancer. The stage of the disease was determined according to the FIGO 2009 criteria (6). Endometrioid adenocarcinoma tumors with grade 1-2 histology were classified as type 1 tumors and grade 3 histology and non-endometrioid tumors were classified as type 2. In our study, USG, CT, and MR imaging methods were compared with reference to the final pathology report in terms of sensitivity, specificity, positive and negative predictive value in detecting myometrial invasion, cervical involvement, and pelvic lymph node involvement. The demographic, clinical findings of the cases were compared in order to reveal the factors that may affect the level of this compliance.

Statistical Analyses

All data were analyzed using the Statistical Package for the Social Sciences software version

18.0 (SPSS Inc. Chicago, IL, USA). Kolmogorov–Smirnov test was used to determine whether numeric variables are distributed normally or not. The ability of USG, CT, MRI value to predict pelvic LAP, cervical involvement, lower uterine segment involvement, and myometrial invasion were examined by receiver operating characteristic (ROC) curve and their respective areas under the curve, in which sensitivity is plotted as a function of 1- specificity. A level of 95% confidence interval was used. A two-sided P value <0.05 was taken as statistically significant.

RESULTS

In our study 252 USG, 89 CT, 147 MRI examinations were evaluated. To detect deep myometrial invasion MR had the highest sensitivity value (89.36%). USG proved its superiority to the CT and MRI for detecting cervical involvement (71.4% vs 15.4% and 22.7%). CT and MRI had very low sensitivities to visualize pelvic lymph-node metastasis (respectively 15.4%, 22.7%). For deep myometrial invasion, cervical involvement and lymph node metastasis all modalities had low positive predictive values (Table-1).

Table-1. Evaluation of imagine modalities for sensitivity, specificity, PPV, and NPV among MI, CI andpelvic lymph node metastasis.

Sensitivity	USG (%)		CT (%)	MRI (%)
MI 1/2<	68.5		79.1	89.36
Cervical involvement	71.4		15.4	22.7
pelvic LAP	-		2.1	16.6
Specificity				
MI1/2<	26,7		37.9	32.43
Cervical involvement	98.3		95.0	87.0
Pelvic LAP	-		87.2	53.1
PPV				
MI 1/2<		30.7	52.6	45.65
Cervical involvement		33.3	33.3	33.3
Pelvic LAP	-		14.2	32.0
NPV				
MI1/2<		72.3	73.3	86.2
Cervical involvement		89.7	87.4	87.7
Pelvic LAP	-		88.2	90.6

LAP: lymphadenopathy, PPV: Positive predictive value, NPV: Negative predictive value, MI:Myometrial invasion

DISCUSSION

For preoperative staging, imaging by transvaginal USG and/or MRI is valuable to assess local tumor extent, and positron emission tomography-CT (PET-CT) and/or CT to assess lymph node metastases and distant spread. Although accuracy tests of preoperative imaging methods have shown some limitations, transvaginal USG, MRI, and CT may identify deep myometrial invasion, cervical stromal involvement, pelvic and/or Para aortic lymph node metastases, and distant spread.

In a recent meta-analysis, pooled estimated sensitivity and specificity for diagnosing deep myometrial invasion were 75% and 82% for transvaginal USG, and 83% and 82% for MRI (7). Even MRI showed better sensitivity than transvaginal USG for detecting deep myometrial invasion in women with endometrial cancer, the difference observed was not statistically significant (7). But in our study, there was a discrepancy in the efficacy of USG, CT, and MRI imaging modalities to exclude deep myometrial invasion due to very low specificity. On the other

hand, the sensitivity of all modalities is comparable with literature (7), where CT and MRI have 10 and 20% higher detection rates than USG (68.5% vs79.1% vs 89.36%) (table).

Savelli et al showed that when done by an expert sonographer USG had good accuracy comparable with MRI for local staging (8). In our study, USG had much better sensitivity for cervical involvement, but we found that MRI had very low detection rates for cervical involvement.

CT and MRI imaging modalities are both comparable for the detection of pelvic lymph-nodal metastasis preoperatively. But CT has priority due to easy accessibility and shorter time (9). These lower results may be attributed to radiologists who are not specialized in the field of gynecology at the radiology department of the institution.

Due to the retrospective nature of our study, it has some limitations, lacking of prospective design which facilitates to exclude bias and enable optimal randomization. Another important confounding factor is the heterogeneity of the radiologist who is not specialized in the field of gynecologic imaging techniques, which can be an explanation for low sensitivity for detection of cervical involvement and, low specificity to rule out deep myometrial invasion. To surpass inefficiency of detection rate, every center should make their radiologist specialized in specific fields.

CONCLUSION

In medical centers where there is no facility for intraoperative pathologic evaluation for the extent of endometrial cancer, to achieve high accuracy for the extend of the disease preoperative imaging techniques may guide the surgeon to perform an optimal surgical approach for limiting the extent of the surgery, and in case of extra uterine spread findings on these radiologic imagines may also enable the surgeon to refer the patient to the tertiary health center where there is enough facility for optimal surgical staging.

Conflict of interest: All authors declare that there is no conflict of interest for this study.

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