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MRI, PET/CT and ultrasound in the preoperative staging of endometrial cancer — A multicenter prospective comparative study

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HIGHLIGHTS

- PET/CT and MRI are equal in predicting myometrial invasion, cervical involvement and lymph node metastases in endometrial cancer patients.
- Transvaginal ultrasound has high specificity and accuracy in predicting myometrial invasion and cervical involvement in endometrial cancer patients.
- Imaging cannot replace surgical staging yet. However, the modalities may be valuable in the multidisciplinary treatment planning.

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ABSTRACT

Objectives. The aim of this prospective multicenter study was to evaluate and compare the diagnostic performance of PET/CT, MRI and transvaginal two-dimensional ultrasound (2DUS) in the preoperative assessment of endometrial cancer (EC).

Methods. 318 consecutive women with EC were included when referred to three Danish tertiary gynecological centers for surgical treatment. Preoperatively they were PET/CT-, MRI-, and 2DUS scanned. The imaging results were compared to the final pathological findings. This study was approved by the National Committee on Health Research Ethics.

Results. For predicting myometrial invasion, we found sensitivity, specificity, PPV, NPV, and accuracy for PET/CT to be 93%, 49%, 41%, 95% and 61%, for MRI to be 87%, 57%, 44%, 92%, and 66% and for 2DUS to be 71%, 72%, 51%, 86% and 72%. For predicting cervical invasion, the values were 43%, 94%, 69%, 85% and 83%, respectively, for PET/CT, 33%, 95%, 60%, 85%, and 82%, respectively, for MRI, and 29%, 92%, 48%, 82% and 78% for 2DUS. Finally, for lymph node metastases, the values were 74%, 93%, 59%, 96%, and 91% for PET/CT and 59%, 93%, 40%, 97% and 90% for MRI. When comparing the diagnostic performance we found PET/CT, MRI and 2DUS to be comparable in predicting myometrial invasion. For cervical invasion and lymph node metastases, however, PET/CT was the best.

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Conclusions. None of the modalities can yet replace surgical staging. However, they all contributed to important knowledge and were, furthermore, able to upstage low-risk patients who would not have been recommended lymph node resection based on histology and grade alone.

Introduction

Imaging is important in the multidisciplinary management of uterine malignancy and includes characterization and staging of tumor, treatment planning, and subsequent follow-up. Endometrial cancer (EC) is the most common uterine malignancy. The treatment of EC is primarily surgical, and the extent of surgery relies on the estimated stage and risk of extra-uterine disease. The most important risk factors for extra-uterine disease and poor outcome are depth of myometrial invasion (MI), cervical involvement (CI), tumor grade and histological sub-type, and lymph node metastases (LNM). A major obstacle is that these factors cannot be revealed by clinical examination alone. Therefore, the clinical challenge is the optimal selection of patients for more extensive surgical procedures (i.e. lymph node dissection or optimal debulking) in patients with high risk of advanced disease and relapses, while avoiding overtreatment in low-risk patients, as studies have shown that lymphadenectomy can induce complications and may not increase survival of low-risk EC patients [1,2]. A non-invasive technique that identifies LNM and tumor-extent would be beneficial. However, optimal imaging modality and practice varies among centers and results are not in agreement [3].

Magnetic resonance imaging (MRI) is considered the most accurate imaging technique for preoperative assessment of EC because of its excellent soft-tissue contrast-resolution [4,5]. Unlike ultrasound, MRI is not operator dependent and unlike computed tomography (CT) it has no radiation burden [6].

2-[Fluorine 18] flouro-2-deoxy-D-glucose (FDG) positron emission tomography (PET) is a functional method based on the increased

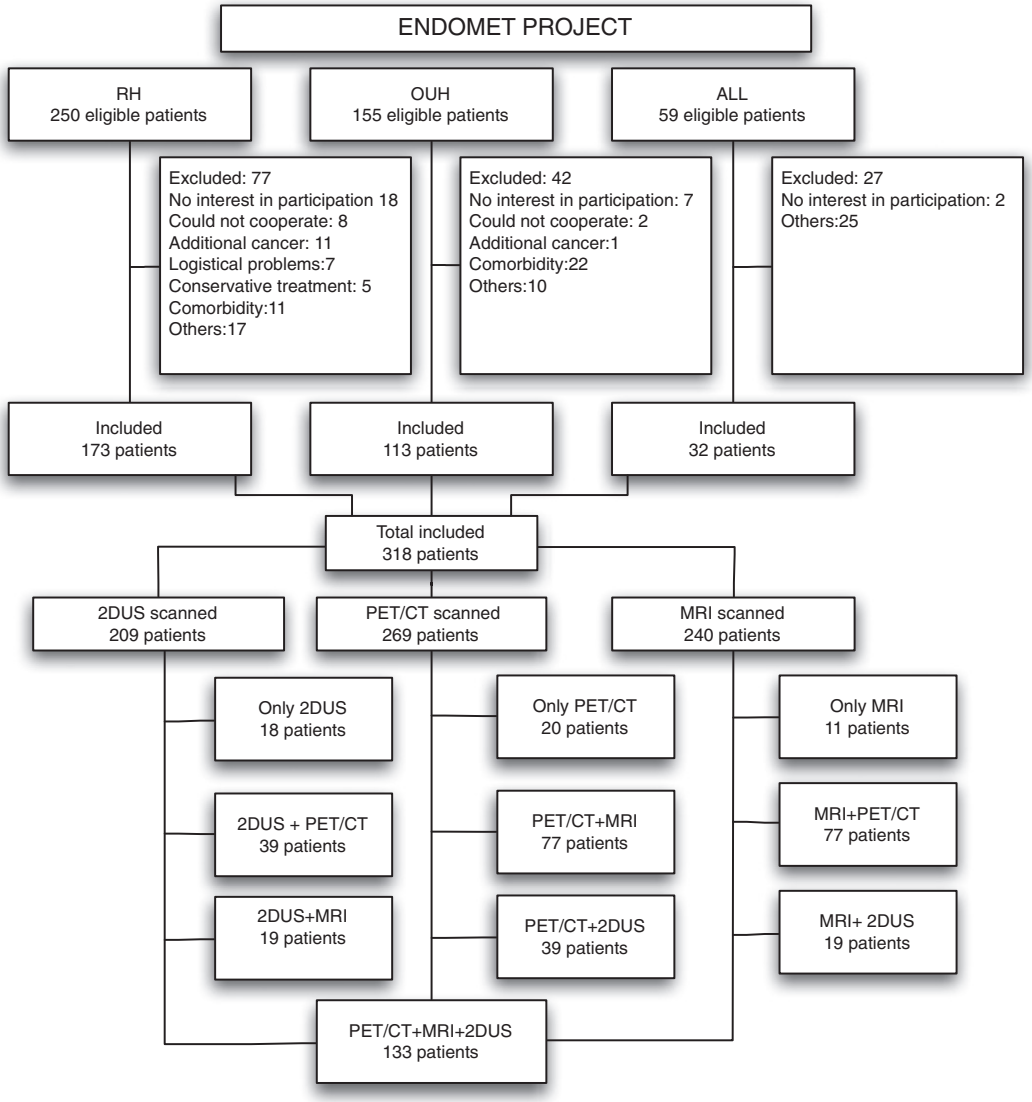

Fig. 1. Flowchart for the study. RH: Rigshospitalet, Copenhagen University Hospital, OUH: Odense University Hospital, AAL: Aalborg University Hospital.