Impact of PET/MR Imaging in Patients with Gynecologic Cancers Undergoing Same-Day PET/CT: A Patient-Centric Approach

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Introduction

Gynecological malignancies are the leading cause of cancer death among females.

Early and accurate assessment of disease status in gynecological malignancies is paramount for optimum surgical planning and outcome prediction.

Currently, PET/CT and MRI are the two commonly used diagnostic imaging techniques for staging gynecological neoplasms.

Many patients undergo both MR and PET/CT as these two studies provide complementary information and guide management.
Introduction

However, the patients face significant burden leading to poor satisfaction & patient experience.

| Long scanning time for each individual modality | Significant waiting time between the PET/CT and MR, which can contribute to patient fatigue |

The goal of our project was to compare the impact of combined positron emission tomography (PET) and magnetic resonance (MR) imaging to that of combined PET and computed tomography (CT) performed on the same day in patients with gynecologic cancer.

We aimed to decrease the overall scanning time by 20%, by transitioning to a “one-stop shop” combined PET/MR study for staging gynecologic malignancies, in lieu of performing a PET/CT and pelvic MRI.
Rationale for PET/MR versus PET/CT

- Positron emission tomography/magnetic resonance imaging (PET/MRI)
- Positron emission tomography/computed tomography (PET/CT)

With PET/MR, we get all the information as PET/CT but also advanced information including DWI features, better contrast resolution, and decreased radiation by eliminating CT component – A Win-Win situation!
In this traditional model, apart from the actual lengthy scanning time, the patients had to wait for a significant amount of time between the procedures, contributing to patient discomfort.

In our project, combined PET/MR imaging was only performed in those patients who were undergoing same-day PET/CT, utilizing the same radioactivity as required for a stand-alone PET/CT study.

Methodology: A peak into Traditional Scanning workflow

Methodology- Change is required to improve patient experience
Methodology

We evaluated the time taken for performing the PET/CT, standard pelvic MRI, and the combined PET/MR.

We also evaluated the diagnostic performance of the PET/CT and PET/MRI for TNM staging.

The McNemar test was employed for statistical analysis. P-values < 0.05 were considered statistically significant.
Results

- 49 patients were included in the final analysis.
- Median age of 51 years (range 23-75).

Based on cancer type:
- Cervical Cancer: 66%
- Uterine cancer: 10%
- Vulvovaginal cancer: 14%
- Ovarian cancer: 6%
- Unknown primary: 4%
Time spent in the imaging area

- PET/CT: 143 minutes check-in to 132 minutes leave
- PET/MR: 170 minutes check-in to 157 minutes leave
- MRI: 134 minutes check-in to 79 minutes leave
- PET/CT+MRI: 277 minutes check-in to 211 minutes leave

Legend:
- Blue: check-in to leave
- Orange: appointment time to leave
Performing a PET/MR reduced time spent in the department by 38.6% which was well over the proposed 20%.

PET/MRI detected primary tumor in 8 patients that were missed using PET/CT.

PET/MRI detected adenopathy in 5 patients that were missed using PET/CT.

However, given the very low sample size, it is difficult to interpret these findings. Larger studies would be required for validation of superior diagnostic performance.
Hybrid PET/MRI combines the advantages of both MR and PET, thereby providing superior soft tissue contrast resolution, as well as vital functional information regarding the tumor metabolism.

Our project confirmed that the combined PET/MRI can successfully reduce patient scanning time and wait time, without compromising diagnostic performance.

Performing a PET MR will reduce the time spent by the patient in the hospital and may improve patient experience and satisfaction.