Gynecological Cancers

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C. Tabouret-Viaud, A. Baskin, and P. Loubeyre

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Cervical cancer is the second most common cancer in women worldwide. There are about 60,000 newly detected cases and 30,000 deaths each year in Europe.

18F-FDG-PET is already recommended to evaluate lymph node extension and was proven superior to MRI for detection of lombo-aortic lymph node extension, which is a major prognostic factor [1, 2]. Moreover, whole-body PET is able to detect distant metastases, and is recognized as having an interest in assessing treatment response 3 months after the completion of concurrent chemoradiation [3].

Given its excellent soft-tissue contrast, MRI plays an important role in the delineation of cervical lesions, and possible vaginal, parametrial, rectal or bladder invasion [4, 5]. Some MRI sequences such as dynamic contrast enhanced MRI can also provide additional information for the assessment of response to therapy [6].

Therefore, PET and MRI are complementary for cervical cancer local, loco-regional and distant staging and re-staging.

Thus, hybrid PET/MRI could be very useful for this indication, time-sparing for patients, and diminishing the total dose of radiation they receive in comparison with PET/CT.

C. Tabouret-Viaud (✉) • A. Baskin • P. Loubeyre
Department of Imaging, Division of Nuclear Medicine and Molecular Imaging, Geneva University Hospital, Rue Gabrielle Perret Gentil 4, 1211 Geneva 4, Switzerland
e-mail: claire.tabouretviaud@hcuge.ch

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Squamous Cell Carcinoma of the Cervix

Clinical History

Fifty-one-year-old patient with FIGO IIIB squamous cell carcinoma of the cervix. Study requested for staging and evaluation of lymph-node extension for radiotherapy planning.

Imaging Technique

Whole-body PET acquired 60 min after injection of 369 MBq of ^{18}F-FDG, with 5.2 mmol/L of fasting glycemia. Whole body atMR (T1 weighted), supine position. TSE T2 weighted MRI sequences in sagittal, coronal and axial planes (TR: 3,400 ms; TE: 100 ms; NSA: 2; voxel: 0.7/0.7/3 mm), cardiac 32 CH coil. Supine position.

Findings

Forty-two-millimeter cervical lesion with serous invasion of the cervix, involvement of 2/3 of the vagina, and numerous retroperitoneal metastatic lymph nodes. This patient was not eligible for surgical treatment and underwent chemoradiotherapy.

Teaching Points

PET clearly demonstrates diffuse iliac and retroperitoneal lymph node invasion. In particular, para-aortic suprarenal lymph nodes are invaded, which is important information to know before determining the radiation field (usually, the radiation field does not extend above the renal veins in cervical cancer).

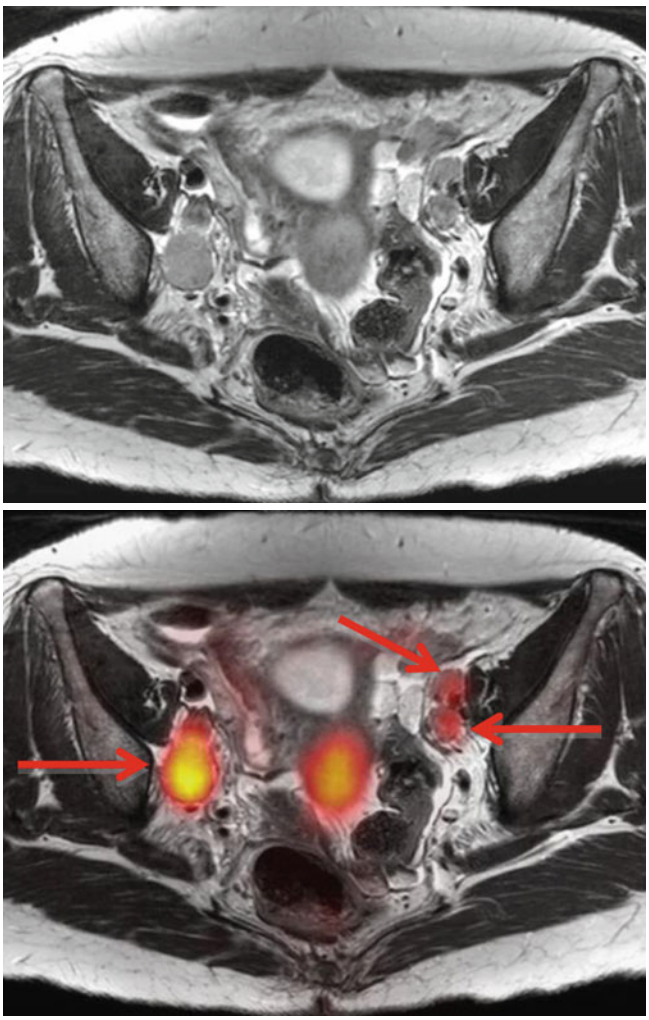

Fig. 7.1 T2 weighted TSE axial MRI sequence (*top*), fused with PET images (*bottom*), showing right and left metastatic iliac lymph nodes (*arrows*)

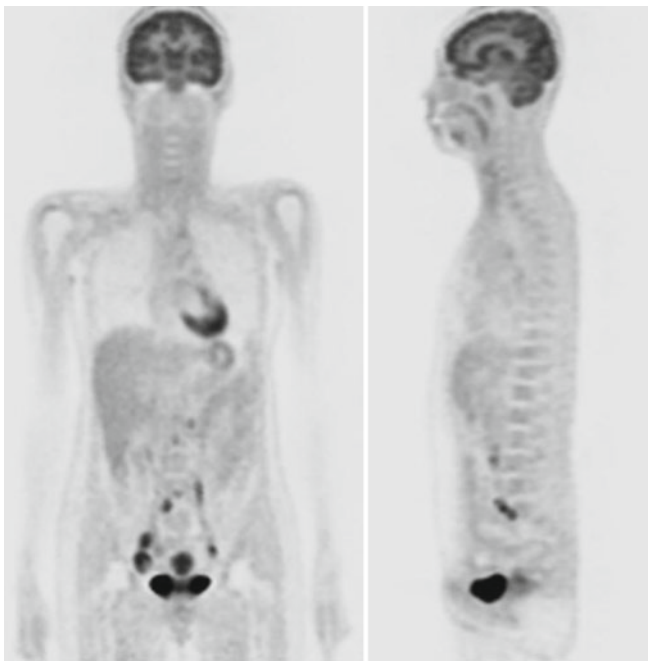

Fig. 7.2 Frontal and lateral views of the whole-body PET MIP, showing hypermetabolism of the cervical lesion and lymph nodes invasion

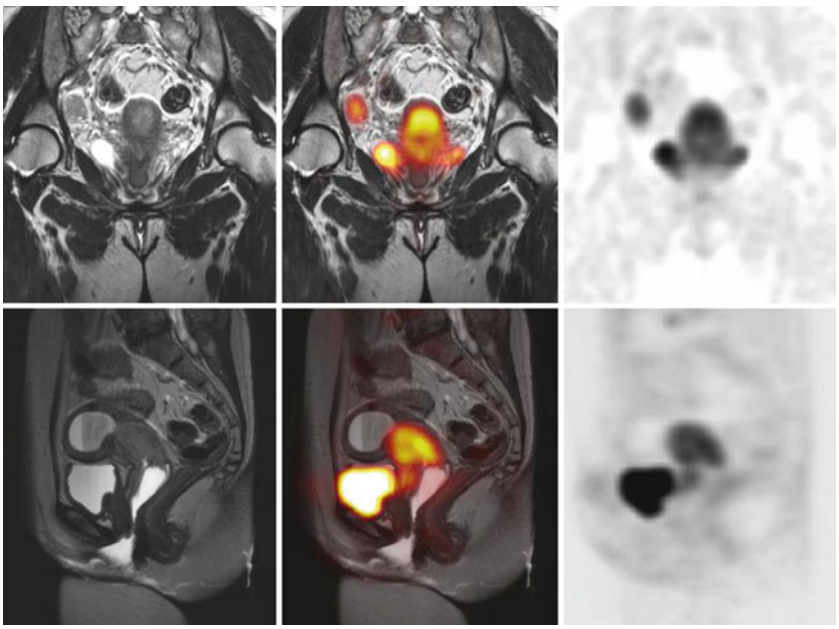

Fig. 7.3 Coronal and sagittal T2 weighted TSE MRI sequences (*left*), fused with PET (*middle*) and PET (*right*), showing the hypermetabolic cervical lesion with invasion of the 2/3 of the anterior and superior wall of the vagina, with liquid retention above the lesion, in the uterine cavity. Two hypermetabolic metastatic lymph nodes can also be seen on the coronal views

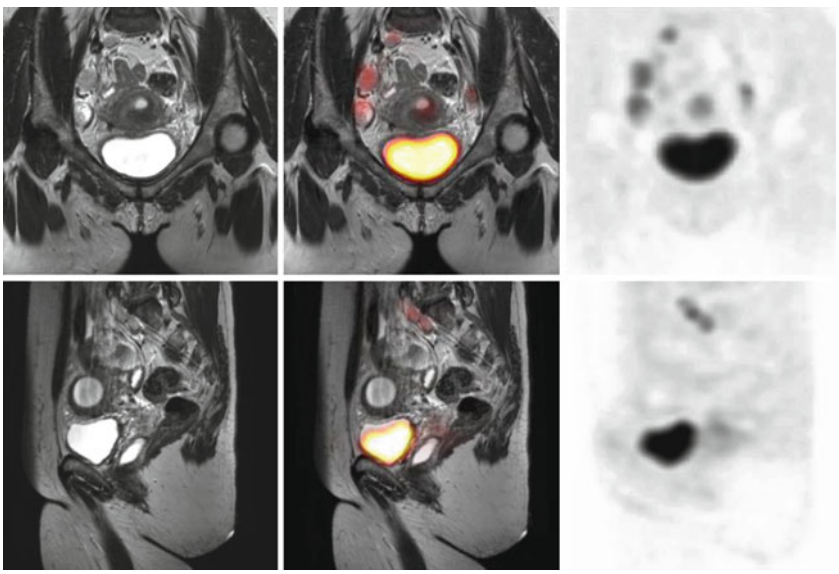

Fig. 7.4 Coronal and sagittal T2 weighted TSE MRI sequences on the *left*, fused with PET in the *middle* and PET alone on the *right*, showing hypermetabolic metastatic bilateral iliac lymph nodes

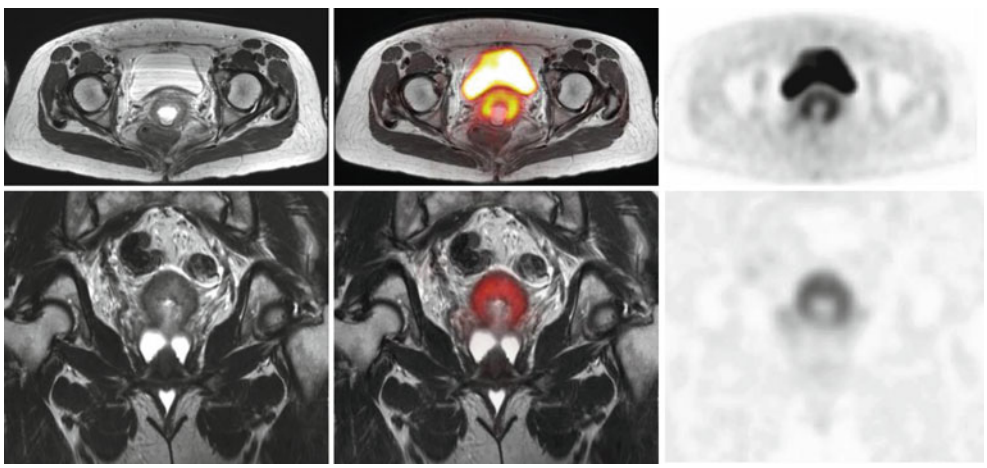

Fig. 7.5 Axial and coronal T2 weighted TSE MRI sequences on the *left*, fused with PET in the *middle* and PET alone on the *right*, showing the hypermetabolic cervical cancer

Cervical Cancer Post Surgery

Clinical History

Twenty-two-year-old patient with FIGO IIA1 squamous cell carcinoma of the cervix. Positive surgical margins on pathological examination of cervical conization. PET/MR was requested for staging prior to further therapeutic decision.

Imaging Technique

Whole-body PET acquired 60 min after injection of 374 MBq of ^{18}F-FDG, with 3.9 mmol/L of fasting glycemia. Whole body atMR (T1 weighted), supine position. TSE T2 weighted MRI sequences in sagittal, coronal and axial planes (TR: 3,400 ms; TE: 100 ms; NSA: 2; voxel: 0.7/0.7/3 mm), STIR and eThrive sequences Supine position.

Findings

Twenty-five-millimeter maximal diameter cervical tumoral process with left serous effraction and minor left parametrial invasion. Surgical treatment is contraindicated and the patient is proposed for chemo-radiotherapy.

Teaching Points

PET helps identify the extent of the disease. No retroperitoneal lymph node invasion was found on PET. Radiation fields were thus limited to pelvic lymph nodes.

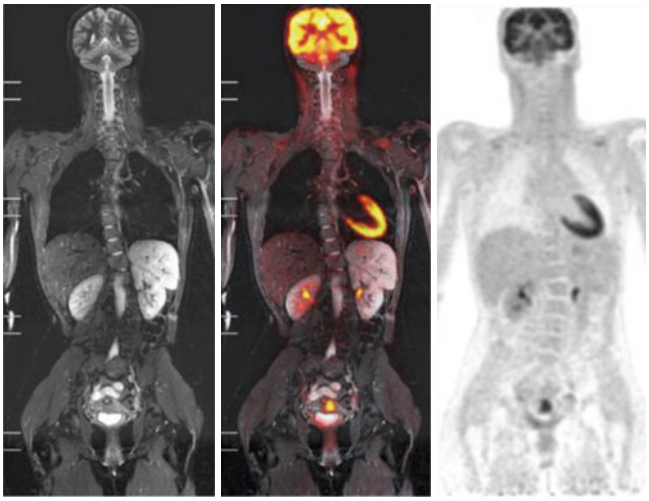

Fig. 7.6 Coronal whole-body STIR sequence on the *left*, fused with PET on the *middle*, and PET alone on the *right*, showing the hypermetabolic cervical cancer

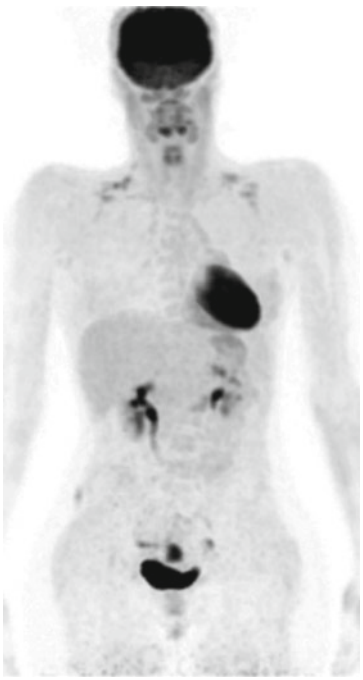

Fig. 7.7 Coronal MIP rendering of FDG-PET study, showing mild hypermetabolism in both supra-clavicular regions, due to physiological brown fat uptake in this young patient

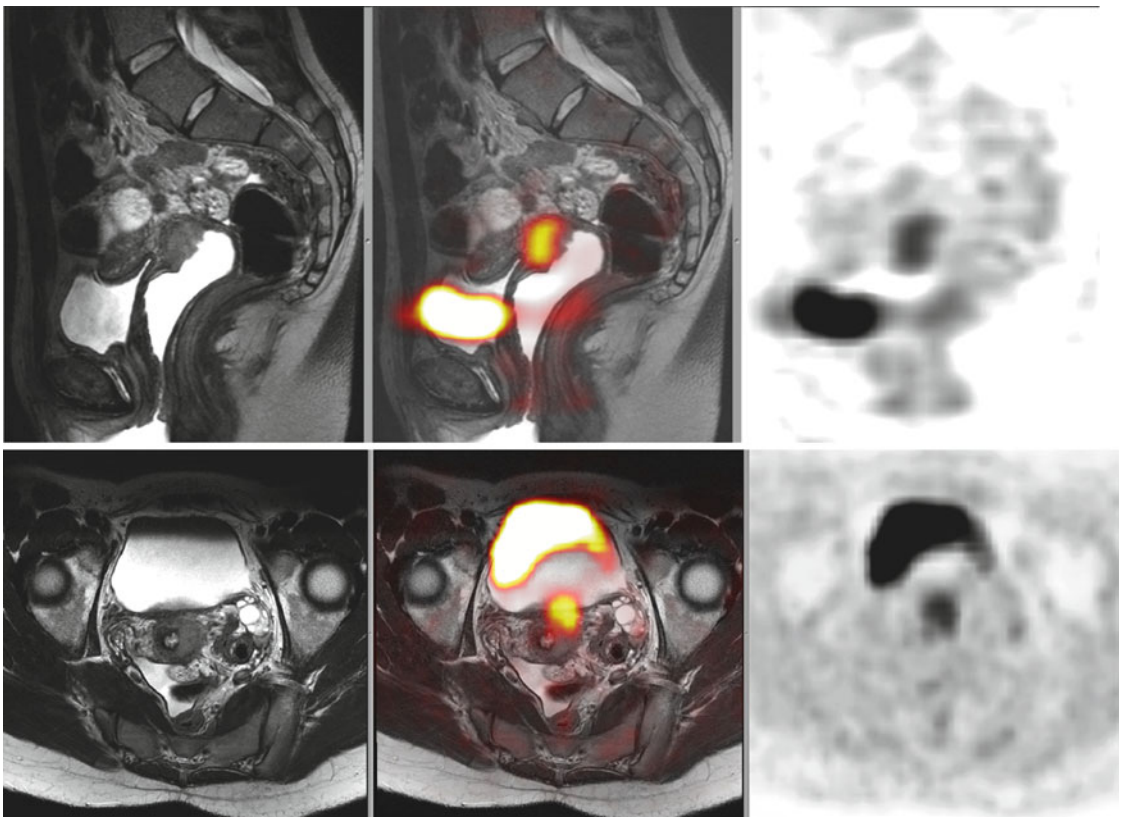

Fig. 7.8 T2 TSE sagittal and axial MRI sequences on the *left*, fused with PET on the *middle*, and PET alone on the *right*, showing the hypermetabolic cervical cancer. The contrast agent in the vagina helps to delineate the cervical lesion

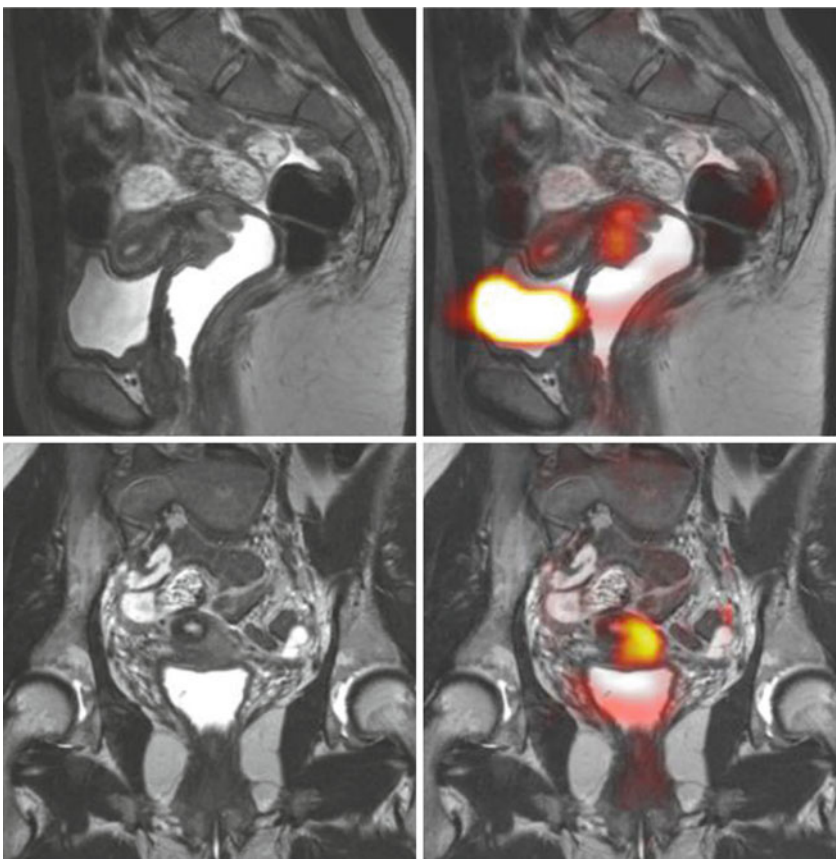

Fig. 7.9 T2 TSE sagittal and coronal MRI sequences on the *left*, fused with PET on the *right*, showing the topographic distribution of the hypermetabolic cervical cancer

Squamous Cell Cervical Carcinoma

Clinical History

Forty-two-year-old patient with FIGO IIB squamous cell carcinoma of the cervix. Study requested for staging prior to surgery.

Imaging Technique

Whole-body PET acquired 60 min after injection of 376 MBq of 18F-FDG, with 5.7 mmol/L of fasting glycemia. Whole body atMR (T1 weighted), supine position. TSE T2 weighted MRI sequences in sagittal, coronal and axial planes (TR: 3,400 ms; TE: 100 ms; NSA: 2; voxel: 0.7/0.7/3 mm), cardiac 32 CH coil. Supine position.

Findings

Sixty-two-millimeter cervical tumor with serous effraction and vaginal involvement on MRI. Bilateral iliac lymph node involvement found on PET/MR. This patient was subsequently scheduled for chemo-radiotherapy.

Teaching Points

The patient had clearly positive lymph nodes on PET/MR: this is a contraindication for surgery. Therefore, PET/MR helped to plan the treatment and the patient had chemo-radiotherapy.

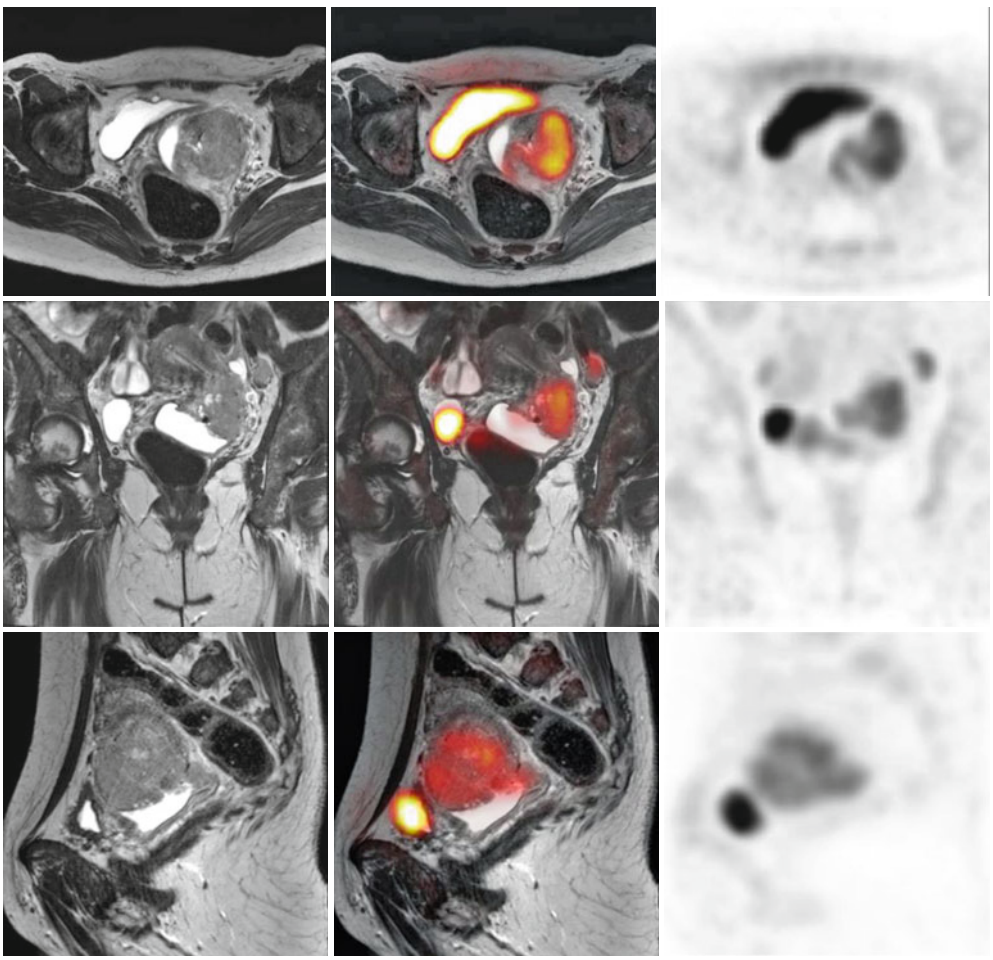

Fig. 7.10 T2 TSE axial, frontal and sagittal SENSE MRI sequences *from top to bottom on the left*, fused with PET on the *middle*, and PET alone on the *right*, showing the large hypermetabolic and heterogeneous cervical tumor

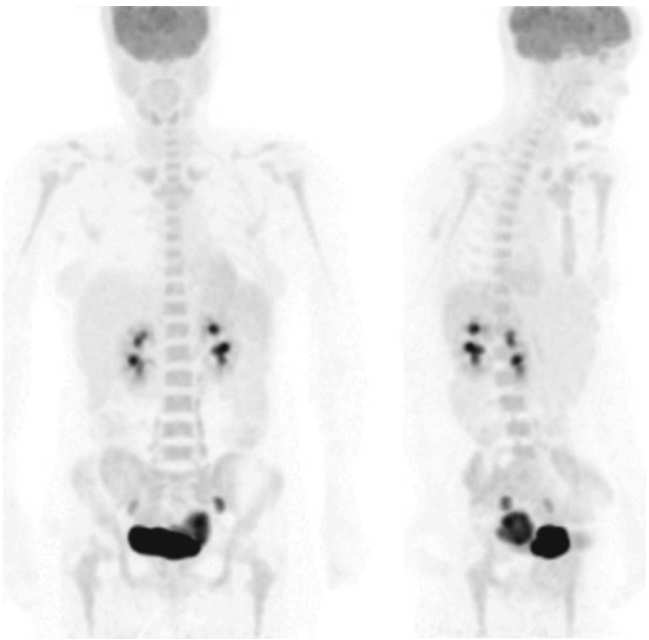

Fig. 7.11 Coronal and left postero-lateral views of the whole-body FDG-PET showing the large hypermetabolic cervical tumor, and bilateral iliac focal uptake in lymph nodes

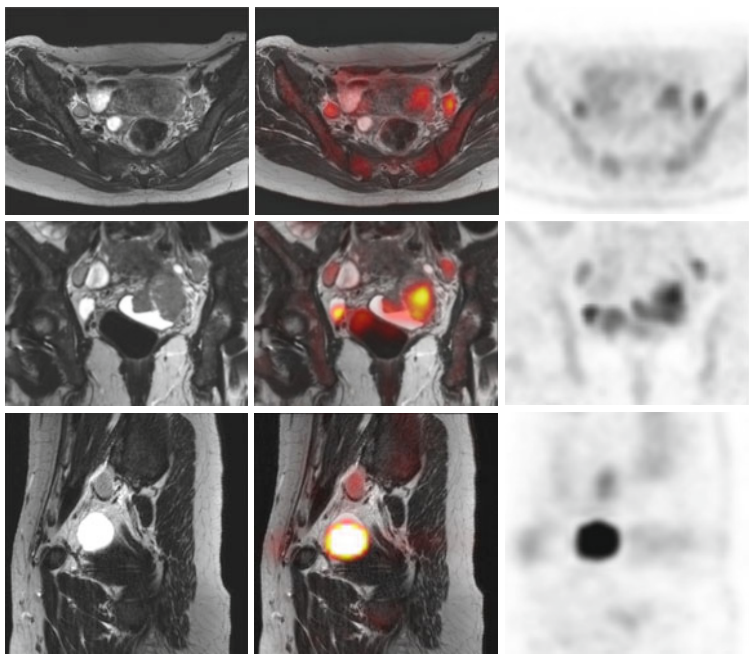

Fig. 7.12 T2 TSE axial (*top*), coronal (*middle*) and sagittal (*bottom*) MRI sequences on the *left*, fused with PET on the *middle*, and PET alone on the *right*, showing bilateral iliac lymph nodes with FDG uptake, therefore suspicious of metastatic dissemination

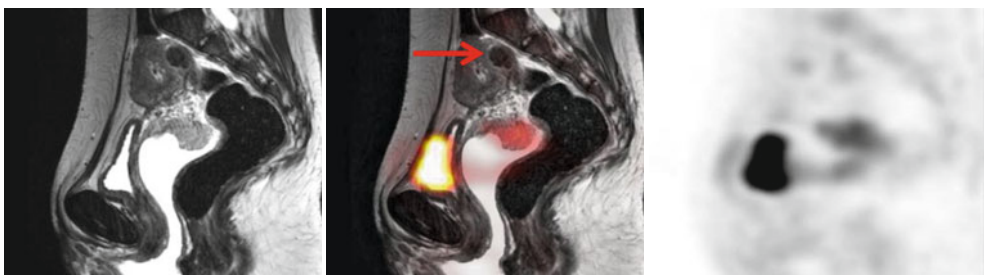

Fig. 7.13 T2 TSE sagittal SENSE MRI sequences on the *left*, fused with PET on the *middle*, and PET alone on the *right*, showing no significant FDG tracer uptake on this uterine lesion, in hyposignal T2, corresponding to a myoma (*arrow*)

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