Case Report

Ga-68 DOTATATE positron emission tomography/computer tomography in initial staging and therapy response evaluation in a rare case of primary neuroblastoma in neck

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ABSTRACT

Gallium-68 (Ga-68) DOTA-peptide positron emission tomography/computer tomography (PET/CT) has higher sensitivity and improved spatial resolution for the detection of somatostatin receptor expressing tumors than conventional somatostatin receptor scintigraphy. We present the findings of Ga-68 DOTATATE PET/CT in a rare case of primary neuroblastoma of the neck in a 12-year-old female child and its role in the evaluation of the treatment response.

Keywords: Extra-abdominal neuroblastoma, gallium-68 DOTATATE, positron emission tomography/computer tomography, response evaluation

INTRODUCTION

Gallium-68 (Ga-68) DOTA-peptide positron emission tomography/computer tomography (PET/CT) has a higher sensitivity and improved spatial resolution for the detection of somatostatin receptor expressing tumors than conventional somatostatin receptor scintigraphy (SRS). Anatomical evaluation of therapy response does not correlate well with progression-free survival, clinical outcome, or quality of life in neuroendocrine tumors (NET). We present Ga-68 DOTATATE PET/CT findings in a rare case of primary neuroblastoma of the neck and its role in the evaluation of the treatment response.

CASE REPORT

The case we present here is about a 12-year-old female child presented with gradual onset painless neck swelling. Contrast enhanced CT study demonstrated large soft-tissue lesions on the left side of the neck, which was later on histopathologically confirmed as neuroblastoma. Ga-68 DOTATATE PET/CT performed for initial staging showed [Figure 1a-c] abnormal tracer uptake in an enhancing large soft-tissue mass on the left side of neck (SUVmax 11.7), the left cervical and axillary lymph nodes, and bones suggestive of primary neuroblastma in the neck with nodal and skeletal metastases. The patient was treated with three cycles of chemotherapy and Ga-68 DOTATATE PET/CT study was repeated for treatment response evaluation. Post-chemotherapy Ga-68 DOTATATE PET/CT showed [Figure 2a-c] decrease in tracer uptake in the soft-tissue mass in the neck (SUVmax 5.1 in comparison to SUVmax 11.7 in the pre-therapy scan), in the cervical and axillary lymph nodes, in the paravertebral mass (SUVmax 5.5 in comparison to SUVmax 11.0 in the pre-therapy scan) and in the bones (SUVmax 3.8 in comparison to SUVmax 10.0 in the pre-therapy scan) without significant change in the size of the lesions suggesting favorable response to chemotherapy. F-18 fluoro-2-deoxy-D-glucose (FDG) PET/CT was also performed before and after chemotherapy, which confirmed favorable metabolic response, although the decrease in uptake of F-18 FDG was of lesser magnitude than decrease in Ga-68 DOTATATE uptake.

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DISCUSSION

Neuroblastoma arises from primitive neuroblasts of the embryonic neural crest. They can occur anywhere within the sympathetic

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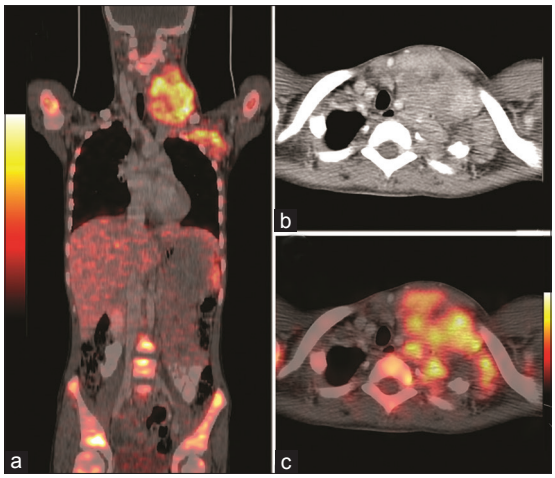

Figure 1: Pre-therapy Gallium-68 (Ga-68) DOTATATE positron emission tomography/computer tomography (PET/CT) coronal image (a) showing abnormal tracer uptake in an enhancing large soft tissue mass in the left neck (SUVmax 11.7), left cervical and axillary lymph nodes, and multiple bones. Transaxial CT (b) and fused positron emission tomography/computer tomography (PET/CT) (c) images show abnormal tracer uptake in a large enhancing soft-tissue mass on the left side of the neck (SUVmax 11.7)

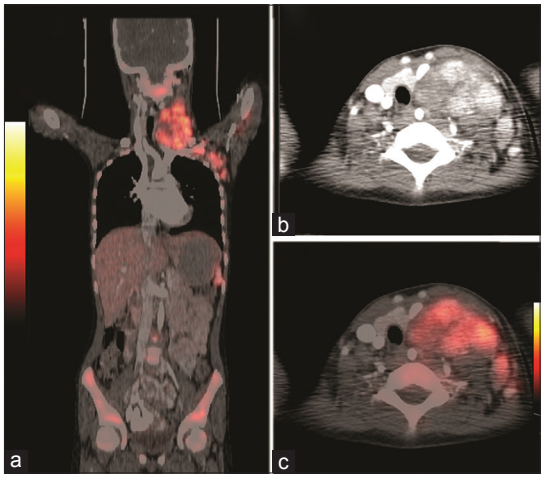

Figure 2: Post-chemotherapy Ga-68 DOTATATE PET/CT coronal image (b) shows decrease in tracer uptake in the soft-tissue mass in the neck (SUVmax 5.1), cervical and axillary lymph nodes and in the skeleton without significant change in the size of the lesions. Transaxial CT, (b) and fused PET/CT (c) images show a significant decrease in tracer avidity (SUVmax 5.1) compared with pre-therapy scan

nervous system.[1] The primary tumors most commonly occur within the abdomen (65%) and about half of these tumors arise from the adrenal medulla. Other common sites of neuroblastoma include the neck, chest, and pelvis.[2] In general, somatostatin receptors (particularly subtype 2) are expressed in these tumors. Therefore, SRS is a useful imaging modality in patients with neuroblastoma.[3-5] Ga-68-DOTA-peptide PET/CT has higher sensitivity and improved spatial resolution for the detection of somatostatin receptor positive tumors than conventional SRS and is superior to Indium-111 octreotide SPECT in detecting NET.[6] Ga-68 DOTA-peptide PET is superior to I-123 MIBG imaging and even to the CT or MRI technique in pre-therapy staging of neuroblastoma.[7] In this report, we showed Ga-68-DOTATATE PET/CT findings in a patient with primary extra-abdominal neuroblastoma. The peptide receptor radionuclide therapy (PRRNT) with 177 Lu-DOTATATE is safe and feasible in children with relapsed or primary refractory high-risk neuroblastoma.[8] Ga-68 DOTATATE PET/CT study may further help in the selection of patients for PRRNT in such patients with extensive disease.[9]

Anatomical evaluation of therapy response does not correlate well with progression-free survival, clinical outcome, or quality of life in NET.[10] Previous study has shown that the decreased Ga-68 DOTATATE uptake in NET after chemotherapy can predict clinical improvement.[11] In the current case, Ga-68 DOTATATE PET/CT showed favorable metabolic response to treatment despite significant residual tumor on CT. This interesting case illustrates the utility of Ga-68 DOTATATE PET/CT in the staging and treatment response evaluation in a rare case of primary neuroblastoma of the neck.

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