Clinical Applications of ^{68}Ga -PSMA PET/CT on Residual Disease Assessment of Juvenile Nasopharyngeal Angiofibroma (JNA)

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Abstract

We present a case of a 16-year-old boy who underwent ^{68}Ga -PSMA PET/CT for residual disease assessment of juvenile nasal angiofibroma. Positive uptake was noted in residual tumor on PET/CT imaging. However, there was no abnormal uptake in surrounding scar tissues as compared with contrast-enhanced magnetic resonance imaging. These findings were confirmed by biopsy from the scar tissue on posterior ethmoids. ^{68}Ga -PSMA PET/CT may be a potentially valuable tool especially in distinguishing recurrences from surgical site reparative tissue and in planning and delivering stereotactic radiotherapy.

Keywords Angiofibroma · PSMA PET-CT · Juvenile nasopharyngeal angiofibroma · MRI

Prostate-specific membrane antigen (PSMA) is expressed in the endothelial cells of tumor-associated neovasculature of various non-prostatic benign and malignant neoplasms including juvenile nasopharyngeal angiofibroma (JNA) [1–5]. Surgery is the main treatment of choice for JNA. Due to intraoperative difficulties in the extirpation of the tumor completely, the rate of the residual disease varies from 13 to 50% [6, 7]. The exact postoperative assessment with current imaging modalities like contrast CT

and MRI remains still perplexing owing to the contrast enhancement of healing processes and postinflammatory scars [7, 8]. Performance of only postoperative PSMA PET/CT may help overcome this diagnostic challenge and assist in early biochemical residual/recurrent disease identification. It may also assist in planning and delivering stereotactic radiotherapy by avoiding unnecessary radiation to adjacent critical structures which are often overdiagnosed as involved by conventional contrast-enhanced magnetic resonance imaging (CEMRI). A 16-year-old adolescent boy underwent left lateral rhinotomy and gross total excision of the tumor. On follow-up, the patient had no clinical symptoms and nasal endoscopy revealed crusts in the left nasal cavity. Postoperative CEMRI revealed abnormal postcontrast enhancement in the left lateral wall of the sphenoid sinus, posterior ethmoid sinus, and superior wall of the nasopharynx suggestive of residual tumor (Fig. 1a–d). We performed a ^{68}Ga -PSMA PET/CT scan for assessing receptor expression and exact disease delineation. Only head and neck imaging was obtained, as the disease is benign. The scan revealed abnormal uptake ($\text{SUV}_{\text{max}} = 1.29$) only in the left lateral wall of the sphenoid sinus extending intraluminally and into the pterygomaxillary fissure. There was also physiological uptake in the Eustachian tube area and salivary and lacrimal glands ($\text{SUV}_{\text{max}} = 1.96$), which needs to be kept in mind to avoid false positive interpretations. The residual tumor was clearly visualized in PSMA PET/CT

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Fig. 1 Contrast-enhanced magnetic resonance imaging (top row) and ^{68}Ga -PSMA PET/CT (bottom row)

similar to CEMRI (Fig. 1e, f). However, there was no abnormal PSMA uptake in surrounding areas as seen in CEMRI (Fig. 1g, h arrows), indicating postoperative changes which were confirmed by endoscopic biopsy from suspicious areas. The patient is now planned for stereotactic gamma knife therapy for the residual tumor based on the findings of functional PSMA PET/CT.

Compliance with Ethical Standards

Conflict of Interest Pirabu Sakthivel, Alok Thakar, Arun Prashanth, Meivel Angamuthu, Suresh Chandra Sharma, and Rakesh Kumar declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institution and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the prospective clinical study (CTRI/2018/08/015479), including the patient presented in this case report. A separate consent from the patient's father was obtained for publication of the case report.

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