

Left is right and right is wrong: Fluorodeoxyglucose uptake in left hemi-diaphragm due to right phrenic nerve palsy

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ABSTRACT

A 36-year-old Indian man, a recently diagnosed case of the right lung carcinoma underwent fluorodeoxyglucose positron emission tomography-computed tomography (FDG PET/CT) for staging of the malignancy. PET/CT showed increased FDG uptake in the right lung mass, consistent with the known primary tumor. Right hemidiaphragm was found to be elevated on CT, suggesting right diaphragmatic paresis. The PET scan demonstrated asymmetric, intense FDG uptake in the left hemidiaphragm and accessory muscles of respiration, which was possibly due to compensatory increased workload related to contralateral right diaphragmatic paresis. The right diaphragmatic paresis was hypothesized to be caused by phrenic nerve palsy by right lung neoplasm.

Keywords: Diaphragmatic fluorodeoxyglucose uptake, fluorodeoxyglucose, muscle uptake of fluorodeoxyglucose, phrenic nerve palsy, positron emission tomography-computed tomography

INTRODUCTION

18-Fluorodeoxyglucose (FDG) uptake in muscles, in positron emission tomography-computed tomography (PET/CT) scan can be attributed to voluntary muscle activity such as talking, chewing, exercise or involuntary muscle activity like labored breathing or stress induced muscle spasms.^[1-3]

We describe an interesting pattern of FDG uptake in muscles in a case of the right lung malignancy.

CASE REPORT

A 36-year-old Indian male, underwent whole body FDG PET/CT for staging of recently diagnosed right lung carcinoma. He complained of cough and difficulty in breathing since last 3 weeks. The PET/CT scan showed increased FDG uptake in right perihilar lung lesion [black arrow in Figure 1a and red arrows in Figure 1b]

compatible with known lung neoplasm. There was no abnormal FDG uptake in the mediastinal lymph nodes. Maximum intensity projection image also showed increased FDG uptake in accessory muscles of respiration-bilateral sternocleidomastoid and intercostal muscles [blue arrows in Figure 1a] and unilateral, intense FDG uptake in left hemi-diaphragm [red arrows in Figure 1a and c]. On CT, there was no morphological abnormality in any of the above-mentioned muscles with FDG uptake. Coronal CT image revealed elevated right hemi-diaphragm [arrow in Figure 2a], suggestive of right diaphragmatic paralysis. Fused PET/CT image [coronal slice, arrow in Figure 2b], shows intense FDG uptake in left hemi-diaphragm. The maximum standardized uptake value of this uptake was 6.1 (normalized for body surface area). These FDG PET/CT findings suggested a cause-effect relationship, indicating right phrenic nerve palsy caused by the lung neoplasm resulting in right diaphragmatic paralysis. This possibly resulted in asymmetric, intense FDG uptake in the left hemidiaphragm and accessory muscles of respiration, due to compensatory increased workload related to contralateral right diaphragmatic paresis.

DISCUSSION

Muscle FDG uptake can be attributed to voluntary or involuntary muscle activity, increased insulin, surgical interventions and inflammatory conditions affecting muscles.^[4-6] Focal FDG uptake in muscles can also be seen in primary muscle neoplasm or metastatic

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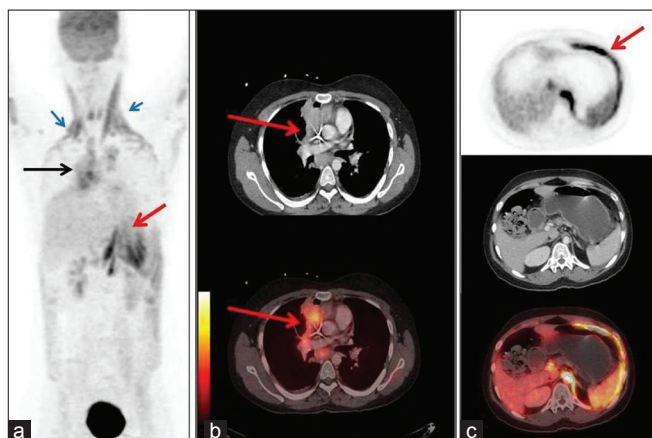


Figure 1: The positron emission tomography/computed tomography scan of a young male, showed increased fluorodeoxyglucose (FDG) uptake in right perihilar lung lesion [black arrow in Figure 1a and red arrows in Figure 1b] compatible with known lung neoplasm. Maximum intensity projection image also showed increased FDG uptake in accessory muscles of respiration-bilateral sternocleidomastoid and intercostal muscles [blue arrows in Figure 1a] and unilateral, intense FDG uptake in left hemi-diaphragm [red arrows in Figure 1a and c]. On CT, there was no morphological abnormality in any of the above-mentioned muscles with FDG uptake

involvement, however in these cases morphologic abnormality may be seen in the corresponding CT images.^[7] Increased FDG uptake in accessory muscles of respiration and bilateral diaphragmatic muscles is known to occur in patients with labored breathing or coughing.^[8,9] In our case, prominent FDG uptake in unilateral diaphragm (left diaphragm) and bilateral accessory muscles of respiration was noted. This was possibly due to contralateral diaphragmatic paresis. This paresis appears to be the result of phrenic nerve palsy caused by neoplastic involvement by lung malignancy.

Neoplastic involvement of the phrenic nerve accounts for one third of cases of diaphragmatic paralysis. Lung carcinomas are the lesions that most commonly affect the phrenic nerve. Other mediastinal tumors that may affect the phrenic nerve include thymomas, lymphomas, and germ cell tumors.^[10]

In our case, elevated right diaphragm seen on CT along with perihilar lung lesion, gave a clue toward phrenic nerve palsy. Phrenic nerve palsy is one of the causes of unilateral diaphragm elevation on imaging. Other causes include-lung volume loss (atelectasis, lobar collapse, partial lung resection, radiation fibrosis, and congenital hypoplasia), congenital eventration and abdominal diseases (dilated stomach or colon, hepatomegaly, splenomegaly, subphrenic abscess).^[11] In our case congenital eventration of the diaphragm was another possibility that can give rise to similar scan findings. However, this was ruled out on the basis of normal report of his chest X-ray performed 4 years ago (as a part of pre-employment check-up).

To conclude, we present PET/CT findings in a case of lung carcinoma, where increased FDG uptake was noted in accessory muscles of respiration and unilateral diaphragm. As in our case, this intriguing uptake pattern could be an ancillary finding to contralateral

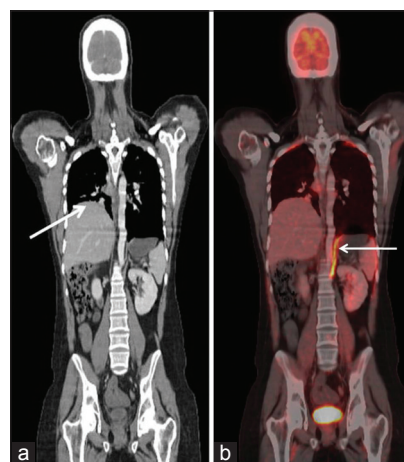


Figure 2: Coronal computed tomography (CT) image revealed elevated right hemi-diaphragm [arrow in Figure 2a], suggestive of right diaphragmatic paralysis. Fused positron emission tomography/CT image [coronal slice, arrow in Figure 2b], shows intense fluorodeoxyglucose uptake in left hemi-diaphragm. The maximum standardized uptake value of this uptake was 6.1 (normalized for body surface area)

diaphragmatic paralysis. In known cases of a lung/mediastinal neoplasm, phrenic nerve palsy can be the cause of such a pattern.

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