Hodgkin Lymphoma – Complete Response to Treatment?

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History

An 18-year-old female patient, with no significant past medical history, presented for evaluation of non-tender lymph nodes on the right side of the neck. A CT scan was recommended and this showed a large mediastinal mass, concerning for lymphoma. A baseline PET-CT scan showed intense FDG uptake within the mass. A biopsy revealed a Hodgkin lymphoma. The patient began chemoradiation and a follow-up Dual Energy CT (DECT) scan was performed two months later.

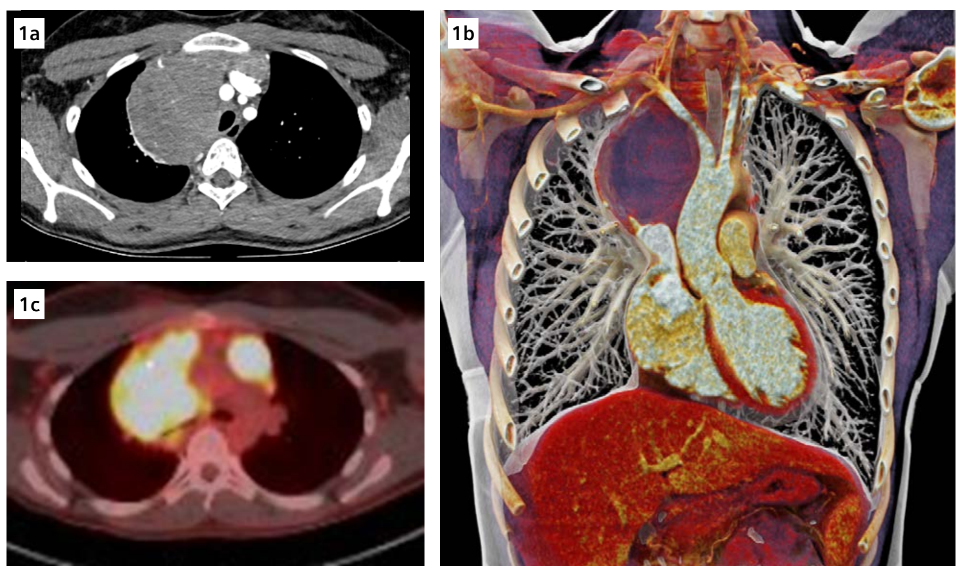
Diagnosis

Axial single energy CT images (Fig. 1a) and coronal cinematic rendering images (Fig. 1b) at diagnosis showed a large paratracheal mass with mild heterogeneous enhancement. Baseline PET·CT scan (Fig. 1c) showed a hypermetabolic mediastinal tumor. On follow-up CT, axial mixed images (Fig. 2a) and coronal cinematic rendering images (Fig. 2b) showed interval decrease in the size of the right paratracheal lymph mass. However, there was a residual mass concerning for active tumor and for incomplete response to treatment. A region of interest placed on the iodine/mixed fused image (Fig. 2c) showed no iodine uptake (0 mg/mL) within the nodal mass, suggesting fibrosis secondary to treatment rather than a residual active tumor. A PET·CT scan (Fig. 2d) on the same day confirmed the absence of metabolic activity within the tumor, supporting the diagnosis of complete response to treatment.

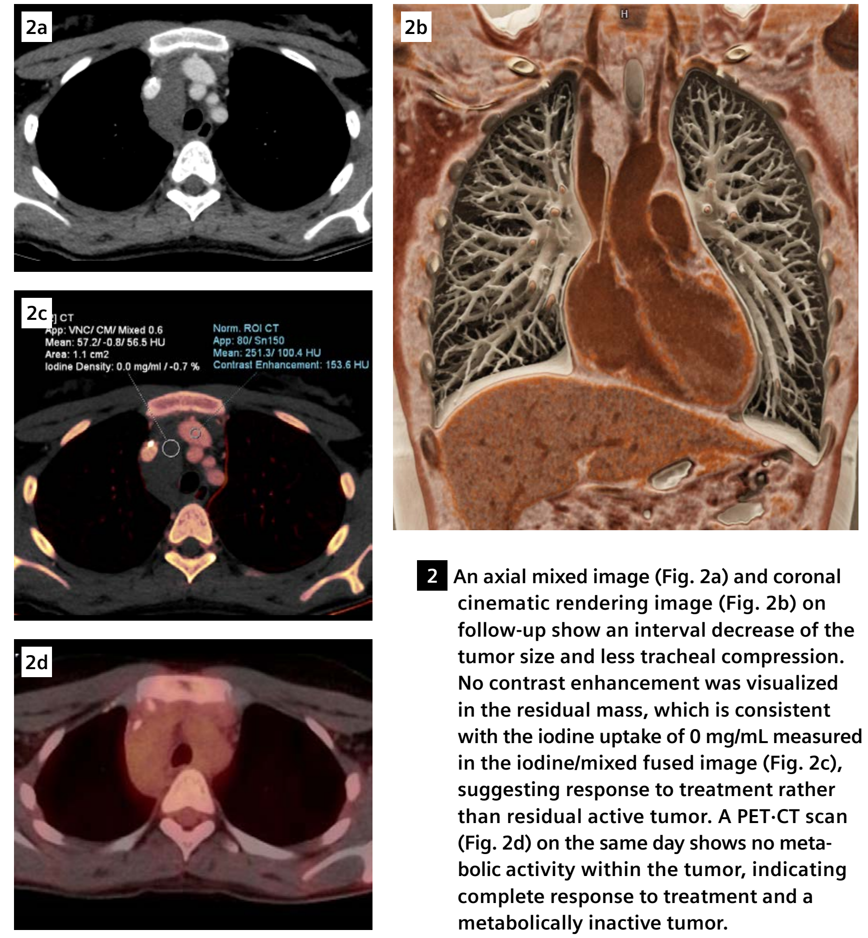
Comments

The use of the iodine images, that can be produced from a DECT acquisition, allows for qualitative and quantitative assessment of tumor perfusion that can help assess the response to treatment. The CT appearance of residual or viable tumor is iodine enhancement and high iodine concentrations. Successful treatment should alter tumor perfusion and thus, decrease the lesion iodine content. Our experience supports the promise of DECT for treatment response assessment. In particular, it shows potential for separating treatment fibrosis, which occurs in tumors such as lymphoma, from an active residual tumor.

In this case, the gray-scale image was equivocal for the diagnosis of a treatment response. By using *syngo*.CT DE Virtual Unenhanced, we were able to generate DE iodine images, showing the absence of iodine concentration in the tumor, and therefore providing a diagnosis of complete treatment response. Dual Source DECT technology allows not only improved diagnostic confidence, but also radiation exposure that is similar to or less than single source CT, owing to the advanced technologies such as Tin filter, CARE Dose4D™ (real-time anatomic exposure control) and ADMIRE (advanced mod-eled iterative reconstruction). DECT using iodine images is an exciting development that may allow assessment of tumor viability at a functional level that precedes change in tumor size. Given the emergence of tumor immunotherapy, iodine images have the potential to identify treatment response in tumors that fail to shrink or which shrink incompletely. ●



1 An axial image (Fig. 1a) at diagnosis shows a large, paratracheal soft tissue mass compressing the trachea, with mild heterogeneous enhancement. A coronal cinematic rendering image (Fig. 1b) shows the craniocaudal extent of the paratracheal mass lateral to the aorta. A baseline PET·CT image (Fig. 1c) reveals hypermetabolic activity within the tumor.



2 An axial mixed image (Fig. 2a) and coronal cinematic rendering image (Fig. 2b) on follow-up show an interval decrease of the tumor size and less tracheal compression. No contrast enhancement was visualized in the residual mass, which is consistent with the iodine uptake of 0 mg/mL measured in the iodine/mixed fused image (Fig. 2c), suggesting response to treatment rather than residual active tumor. A PET·CT scan (Fig. 2d) on the same day shows no metabolic activity within the tumor, indicating complete response to treatment and a metabolically inactive tumor.

The outcomes by Siemens Healthineers customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

In clinical practice, the use of ADMIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

Examination Protocol

Scanner	SOMATOM Force
Scan area	CAP
Scan mode	Dual Source Dual Energy
Scan length	674 mm
Scan direction	Cranio-caudal
Scan time	7.43 s
Tube voltage	80 / Sn150 kV
Effective mAs	124 / 61 mAs
Dose modulation	CARE Dose4D
$CTDI_{vol}$	4.2 mGy
DLP	310.9 mGy cm
Rotation time	0.5 s
Pitch	0.8
Slice collimation	192 × 0.6 mm
Slice width	1.5 mm
Reconstruction increment	1.0 mm
Reconstruction kernel	Qr40 (ADMIRE 3)
Contrast	320 mg/mL
Volume	100 mL
Flow rate	2 mL/s
Start delay	30 s