Radiology Forum

Doughnut Sign on FDG-PET Scan in a Ruptured Lung Hydatid Cyst

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CLINICAL SUMMARY

A 13-year-old girl, complained of fever and cough with mucoid expectoration associated with episodes of streaky haemoptysis. Past history was not significant. On examination vital signs were normal with a pulse oximetry saturation of 98 percent. Chest examination revealed decreased breath sounds in the left mammary and infra-mammary area.

INVESTIGATIONS

Blood count and serum biochemistry were in the normal range. Chest radiograph and computed tomography (CT) of thorax were reported as showing a loculated pleural effusion on the left side. The fluid was aspirated and turned out to be transudate with total proteins of 0.2mg%. Post-aspiration chest radiograph showed an ill-defined opacity in the left mid zone. A repeat CT thorax now showed a well-defined cyst in the lingula with a folded membrane sign suggestive of a ruptured hydatid cyst (Figure 1). Serum immunoglobulin G (IgG) was positive for echinococous granulosus. Fluro-deoxyglucose (FDG) - positron emission tomography (PET) (Figure 2) carried out to assess the extent of the disease showed the uptake along the wall of the cyst with a central photopenic area the "Doughnut sign".

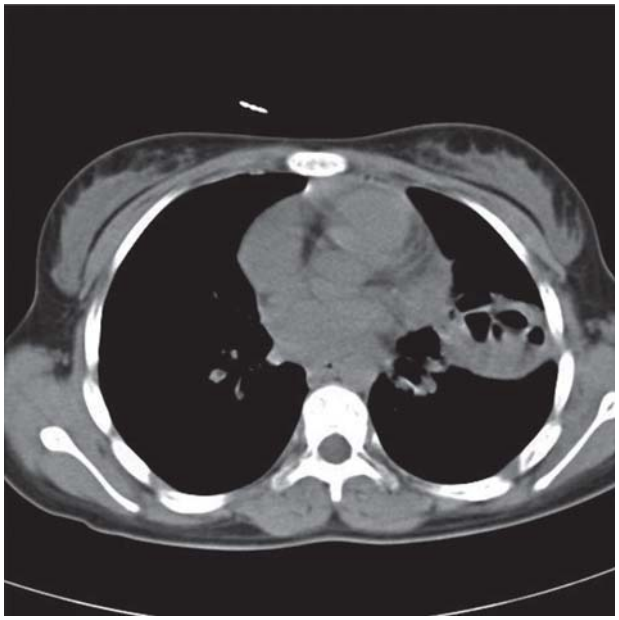

Figure 1. Computed tomography thorax showing folded membrane sign of ruptured hydatid cyst.

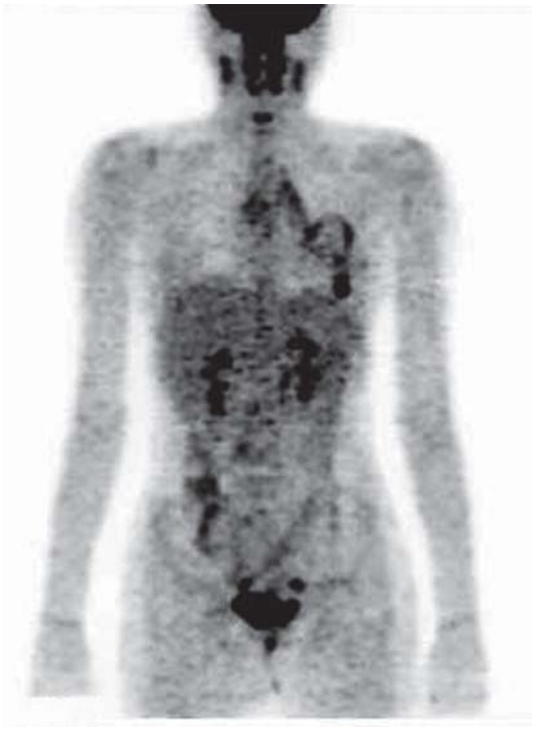

Figure 2. FDG-PET MIP image demonstrating tracer uptake along the cyst wall with central photopenic area—the "Doughnut sign".

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She refused surgery and was advised oral albendazole (10 mg/kg) that she continued to take for one year. She was reassessed with a CT thorax (Figure 3) and an FDG-PET (Figure 4). The CT thorax showed a reduction in the size of the cyst and the FDG-PET showed a significant decrease in the metabolic activity in the region of the cyst, suggesting a good response to albendazole therapy.

Treatment was stopped and the patient is asymptomatic 10 months later.

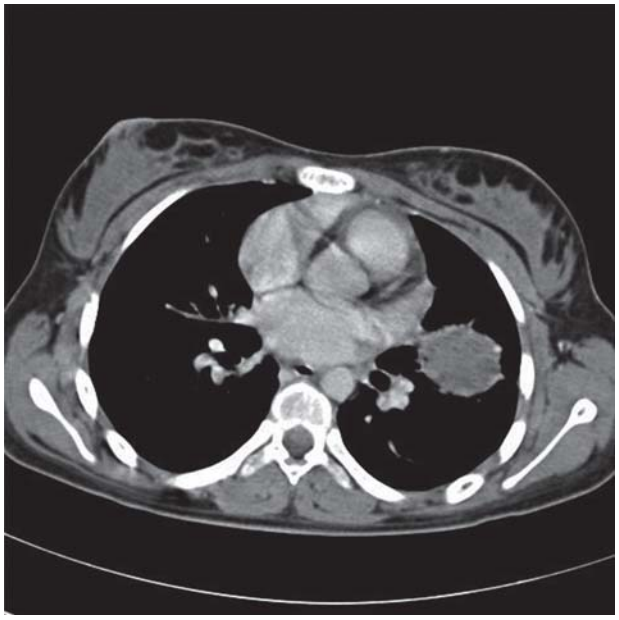

Figure 3. CT thorax one year after medical treatment, showing decreased size of the hydatid cyst.

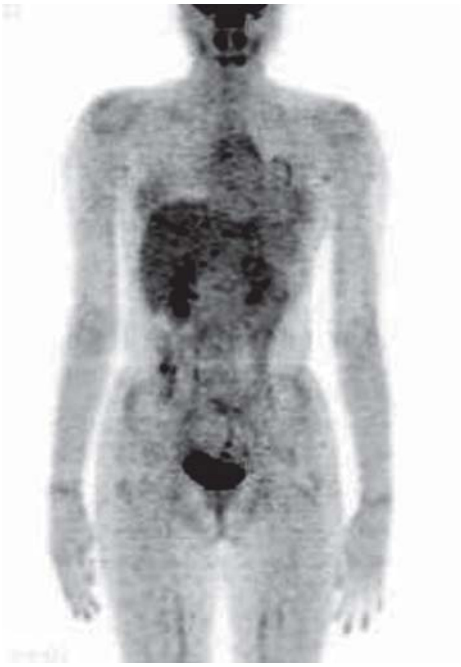

Figure 4. FDG-PET one year after medical treatment, showing significant decrease in uptake in the region of the cyst.

DIAGNOSIS

Ruptured lung hydatid cyst showing "Doughnut sign" on FDG-PET.

DISCUSSION

PET is a promising molecular imaging technique that produces a three-dimensional image of the functional processes in the body. The radiotracer most commonly used in routine clinical practice is flurodeoxyglucose (FDG), which is an analogue of glucose labelled with fluorine-18. The concentration of FDG, imaged with the help of PET reflects the tissue metabolic activity in terms of regional glucose uptake. FDG uptake has been shown to increase not only in tumour cells but also in the inflammatory cells such as neutrophils and activated macrophages that are present at the site of inflammation and infection. Hence, in addition to malignancy, the role of FDG-PET imaging has been explored in benign conditions as well. Among respiratory diseases, it has been studied in sarcoidosis[1], pulmonary[2] and extra-pulmonary tuberculosis,[3] radiation pneumonitis,[4] silicosis,[5] and *pneumocystis jiroveci pneumonia*.[6] There are also a few reports of hydatid cyst of liver[7] and lung[8] being diagnosed on FDG-PET. Usually it is a complicated hydatid cyst, ruptured[9] or infected[10] or both that is detected on FDG-PET or FDG PET-CT. Unruptured hydatid cyst may not show FDG uptake[11] as the membranes are intact and there is no inflammation around the cyst wall. In the present case of ruptured hydatid cyst of lung, uptake was there along the wall of the cyst with central photopenic area and was similar to the "Doughnut sign" described for liver hydatid[7]. However this sign is not specific for hydatid cyst as similar pattern of uptake on FDG-PET can be seen in any inflammatory cystic lesion like lung abscess, malignant cystic lesion or rarely loculated pleural effusion of infective or inflammatory aetiology.

Thus, the role of FDG-PET or FDG-PET-CT in hydatid cyst can be, to support the diagnosis in an established case of hydatid cyst (ruptured or infected or both), to show the extent of disease and to help in monitoring medical treatment in patients with contraindication to surgery.

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