Childhood lipid pneumonia due to animal fat aspiration diagnosed by MRI

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ABSTRACT
A case of a goat's milk fat product (ghee) aspiration pneumonia is described in a 5 month old Saudi boy. The clinical course and radiological features assessed by plain chest x-ray, computerized tomography (CT) and magnetic resonance imaging (MRI) are presented. An MRI Signa 1.5 T apparatus was used with T1 and T2 weighted images and a fat saturation technique for the diagnosis of lipid pneumonia. This technique is presented as being superior to other diagnostic modalities.

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Few causes of lipid pneumonia in childhood have been described, but these include aspiration of oily substances such as mineral oil, cod liver oil, milk and a goats milk fat product (ghee). In some rural regions of Saudi Arabia the practice to administering animal fat to infants and children in the belief that it promotes normal bowel habits and treats coughs and colds as well as preserving their general good health is well known. Aspiration can easily occur and pneumonia or recurrent chest infections are inclined to respond slowly to normal antibiotic therapy. A case with resistant pneumonic lesions has recently been observed, being diagnosed by MRI. Features of animal fat aspiration pneumonia is presented in this paper and differentiation is made from other similar disorders.

Case Report
A 5 month old boy was admitted to the Armed Forces Hospital, Southern Region, Khamis Mushayt, Saudi Arabia (where the author was a Consultant Radiologist) on 29th June, 1995. He was feverish, in poor general condition and had a cough, tachypnea and crepitations on the right side. The patient's parents denied any possibility of aspiration. Plain chest radiography revealed lobar pneumonia. Dense homogenous consolidations without an atelectatic component were noted. In contradistinction, the borders of the consolidated upper lobe were bulging indicating a space occupying type of infiltrate.

Computerized tomography (CT) examination showed a homogenous (tumor like) opacification in the right upper lobe. No atelectatic lesions could be seen. The attenuation value of the consolidation was 30 - 40 Hounsfield units. Despite broad spectrum antibiotic therapy administered according to microbiological culture sensitivities, the patient did not improve. A new CT examination showed some progression of infiltrates to the middle lobe with a more expanded appearance. Magnetic Resonance Imaging (MRI) examination was performed using a Signa 1.5 T apparatus in preference to bronchial tree lavage to confirm the lipid pneumonia. MRI with T1 (TR 400, TE 12), T2 (TR 2000, TE 90) weighted images and a fat saturation technique (TR 633, TE 12) was performed.

The T1 weighted images showed high signal lesions in the right upper lobe and the middle lobe (Fig. 1). The borders of the lobe are bulging, opposite the atelectatic lesion. The signals are not homogenous and there are regions with a variety of signals due to different contents of lung tissue. (Fig. 2). The T2 weighted study shows increased tissue signals in the periphery of the region of lobar pneumonia which might be due to chronic inflammatory tissue with fibrosis. In the middle there are some lower signals similar to tissue with a slight fat content (Fig. 3).

The fat saturated technique revealed diminished signals due to fat suppressing only in the middle of lobe 3.5 x 1.5 cm region and subcutaneously

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located tissue (Fig. 4). The patient received treatment with prednisolone (2 mg/kg per day) in addition to antibiotics and other supportive therapy, with some improvement in his condition. Two months later, a thoracic surgical opinion suggested further antibiotics, corticosteroids and other supportive therapy for a further period of several months.

**Discussion** According to Pinkerton's early work, oil aspiration inhibits mucociliary action in the tracheobronchial tree and the cough reflex disappears. Fatty acids are released after animal fat aspiration due to hydrolysis by lung lipases. These agents are highly toxic and produce a severe inflammatory reaction. Lipoid pneumonia can be considered to have the following stages: hemorrhagic pneumonia with an acute inflammatory reaction; chronic inflammatory infiltrates; granuloma formation (foreign body induced) and progressive fibrosis with an end stage of complete fibrous changes of lung tissue. At this advanced stage of lipoid pneumonia, most of the lesions in the parenchyma are suspected to be chronically inflamed with fibrotic changes. Thus, the expected fat content of the pneumonic lesions was not observed over the entire region of infiltration. The fat characterization signals revealed by MRI are probably more easily shown in the early stages of lipoid pneumonia.

The most striking radiological feature of this case, was the outlining of the infiltrated area with tumor like contours which suggested an increased volume for this type of pneumatic lesion in contradistinction to the atelectatic features seen in other pulmonary pathologies. CT attenuation in our case was between 30-40HU probably due to chronic inflammatory and fibrotic lesions and in accord with the fatty lesions that one would expect.
in the early stage of lipoid pneumonia. MRI examination was a very accurate method (especially a fat saturation technique) and superior to CT in the diagnosis of lipoid pneumonia. Lipoid containing tissues were located in the middle of infiltrates (diagnosed by MRI).

Such authors as Annobil and Carillon suggest MRI examination as a non-invasive investigation superior to bronchial lavage with fat staining in the aspirate. In countries where it is the custom to administer ghee to children, lipoid pneumonia should be suspected in every case of aspiration pneumonia. Early examination with MRI appear to be helpful for accurate and prompt diagnosis and treatment in cases of animal fat aspiration pneumonia.

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