Case 16765

Eurorad

Necrotising pneumonia

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Section: Chest imaging
Area of Interest: Lung Paediatric
Procedure: Contrast agent-other
Imaging Technique: CT
Imaging Technique: Digital radiography
Case Type: Clinical Cases
Authors: Dr. Stephanie Vella1, Dr. Adrian Mizzi2, Dr. Cecil Vella3, Dr. Francis Zarb4
Patient: 3 years, female

Clinical History:

A 3-year-old girl with no significant past medical history was brought to paediatric emergency in view of a 5-day history of fever, cough and lethargy. On examination she was haemodynamically stable and febrile, with decreased air entry in the left lower lung zone. Blood investigations revealed high inflammatory markers.

Imaging Findings:

Chest X-ray (CXR) showed a left pleural effusion with ipsilateral consolidation (Fig. 1). She was admitted for intravenous antibiotics, however, there was no improvement. A left-sided chest drain was inserted under ultrasound guidance and the patient initially improved, however subsequently deteriorated (Fig. 2). Computed tomography (CT) of the thorax was performed (Fig. 3a & b), which revealed complete consolidation of the left lower lobe with no aeration, multiple small pockets of gas and absent enhancement of a large portion of the involved consolidated parenchyma. The left lower lobe bronchus was patent. Findings were in keeping with necrotising pneumonia. A note was made of air within the pleural space surrounding the drain, together with a pocket of air in the left subpulmonic location (Fig. 4a & b). The antibiotic regime was adjusted based on these findings, and over time the patient's clinical and serological status improved significantly. She was fit for discharge and a repeat CXR one week later demonstrated radiographic improvement (Fig. 5).

Discussion:

Background

Necrotising pneumonia is an uncommon, severe complication of community-acquired pneumonia. It was first described in the 1940s in adult patients, only being recently described in children with a reported increasing incidence. [1] The condition is often preceded by a viral infection and the major causative bacterial pathogens include pneumococci and *Staphylococcus aureus.* [2,3]

Pathologically, necrotising pneumonia is characterised by inflammatory changes with intrapulmonary vessel thrombosis and resultant necrosis of lung parenchyma. In addition, suppurative changes are seen, likely due to toxin-mediated cytokine activation and inflammatory response, leading to tissue destruction. [4]

Clinical Perspective

Most affected children are young (<5 years of age) with no predisposing health condition. The clinical signs and symptoms are that of pneumonia, however, despite receiving appropriate antibiotic therapy, patients remain persistently ill with a worsening clinical and radiological picture. [4]

Imaging Perspective

CT is the most sensitive imaging method for the demonstration of complications of pneumonia in children. It is also ideal for the detection of underlying congenital lung malformations. Necrotising pneumonia is diagnosed when a large proportion of consolidated lung appears hypodense and demonstrates decreased or absent enhancement following contrast administration. Associated necrotic cavities are characterised by parenchymal destruction with multiple fluids or air-filled thin-walled cavities with non-enhancing borders. In contrast, an abscess consists of a fluid or air-filled cavity with a well-defined enhancing wall. This distinction is important, as an intervention which may be indicated for abscesses would be detrimental in the case of necrotic pneumonia. Loculated areas of fluid or gas may be seen within the pleural cavity. Additional complications include parapneumonic effusions and empyema when there is an extension of necrotic regions to the pleura, together with bronchopleural fistulae. Rarely severe ischaemia due to vascular compromise results in gangrene. [5,6]

Outcome

Management involves a multidisciplinary approach, with a prolonged course of intravenous antibiotics and ventilatory support forming the mainstay of treatment. Management of pleural complications (effusions, empyema, pyopneumothorax) is with chest-tube drainage with or without fibrinolytic use and rarely decortication. Surgical intervention is avoided due to the risk of bronchopleural fistulae. In rare cases, segmental/lobar resection or pneumonectomy may be required to deal with complications, which include tension pneumatocoeles, pulmonary gangrene involving more than half the affected lobe and massive haemoptysis.

Despite the seriousness of this condition, it does not commonly result in mortality, provided there is timely diagnosis and appropriate management. Good clinical and radiological recovery can be expected within the first 4 months of diagnosis. [7,8]

Take-Home Message / Teaching Points

- The diagnosis of necrotising pneumonia should always be considered when dealing with protracted pneumonia in a previously healthy child, despite at least 72 hours of appropriate antibiotic therapy.
- CT is the mainstay for diagnosis and should not be delayed in such circumstances.
- Despite the short-term severe illness, long-term clinical outcomes are very favourable with minimal resultant morbidity.

Differential Diagnosis List: Necrotising pneumonia, Lung abscess , Secondarily infected congenital lung malformations (CPAM, bronchopulmonary sequestration), Vasculitis (ex: granulomatosis with polyangiitis), Malignancy (ex: primary germ cell tumour, lymphoma), Traumatic pseudocysts

Final Diagnosis: Necrotising pneumonia

References:

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Hodina M, Hanquinet S, Cotting J et al. (2002) Imaging of cavitary necrosis in complicated childhood pneumonia. Eur Radiol 12:391–396.
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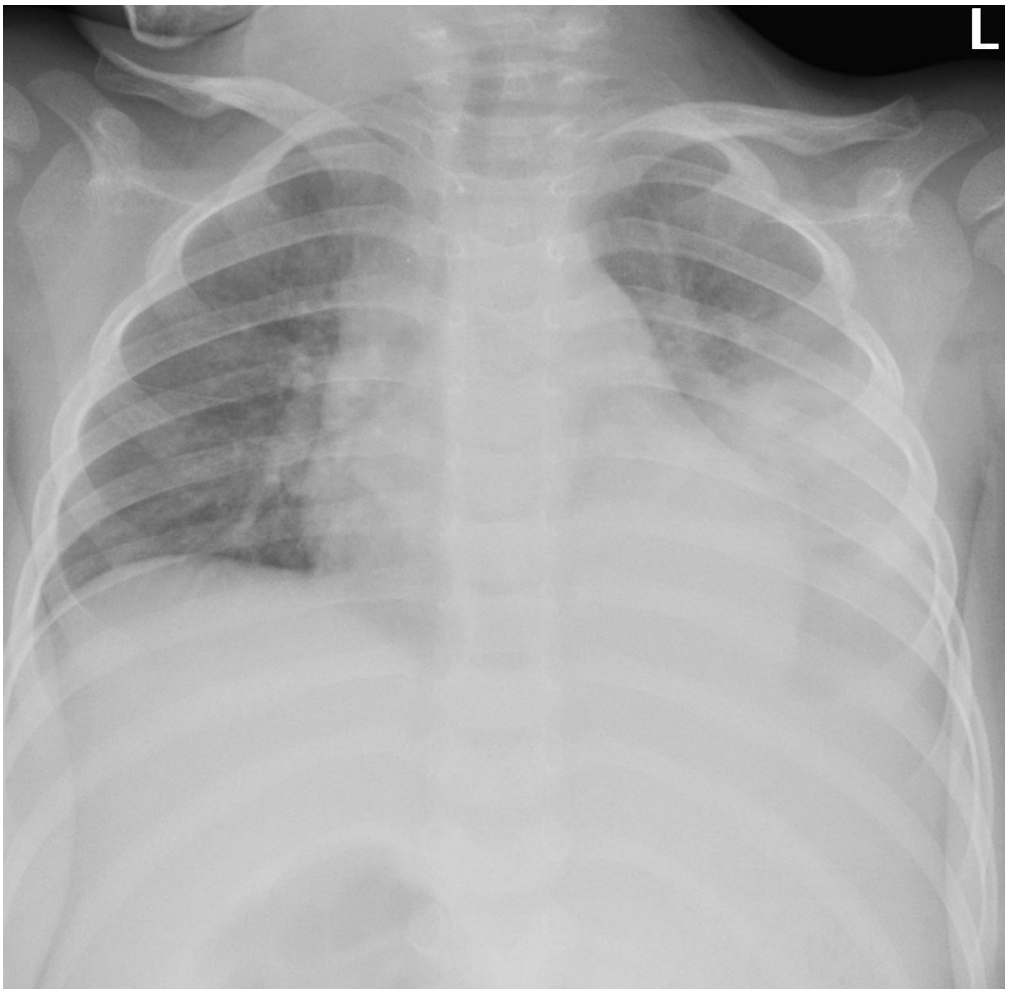
Masters I, Isles AF, Grimwood K. (2017) Necrotizing pneumonia: an emerging problem in children? Pneumonia 9, 11. (PMID: 28770121)

Figure 1

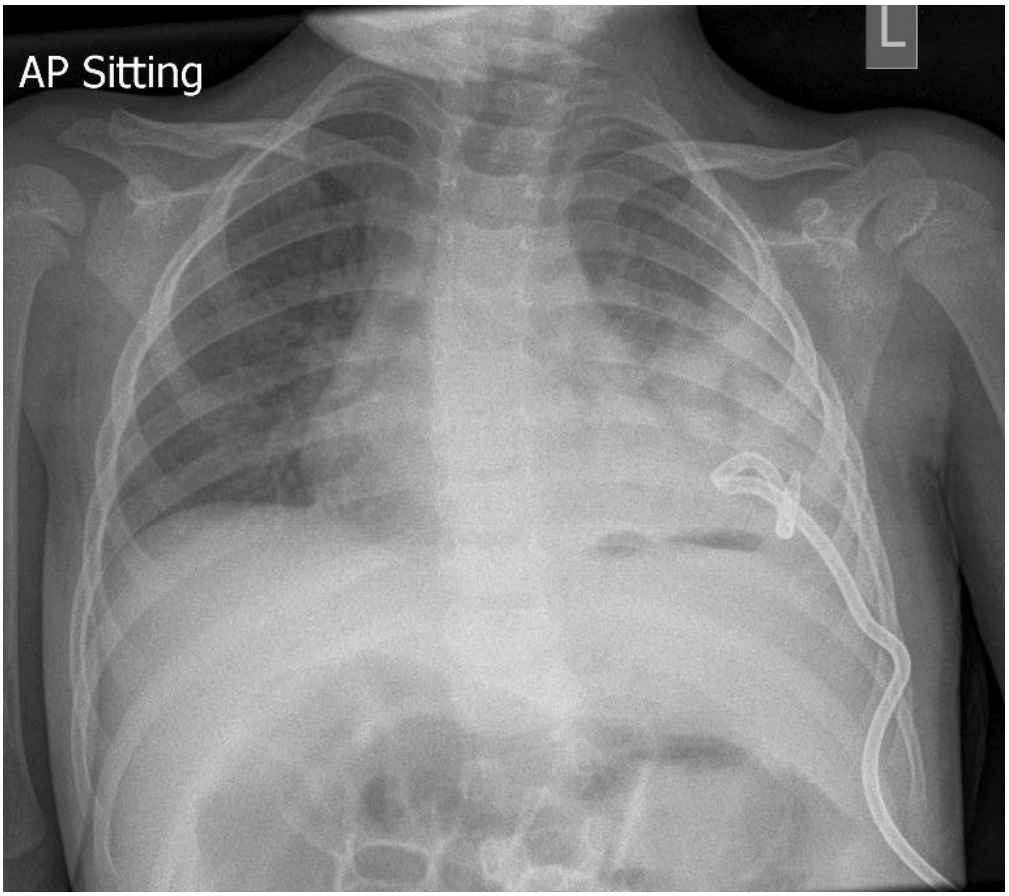
a



Description: CXR at presentation, demonstrating a left middle and lower zone consolidation, with an associated pleural effusion. **Origin:** Medical Imaging Department, Mater Dei Hospital, Malta, 2019

Figure 2

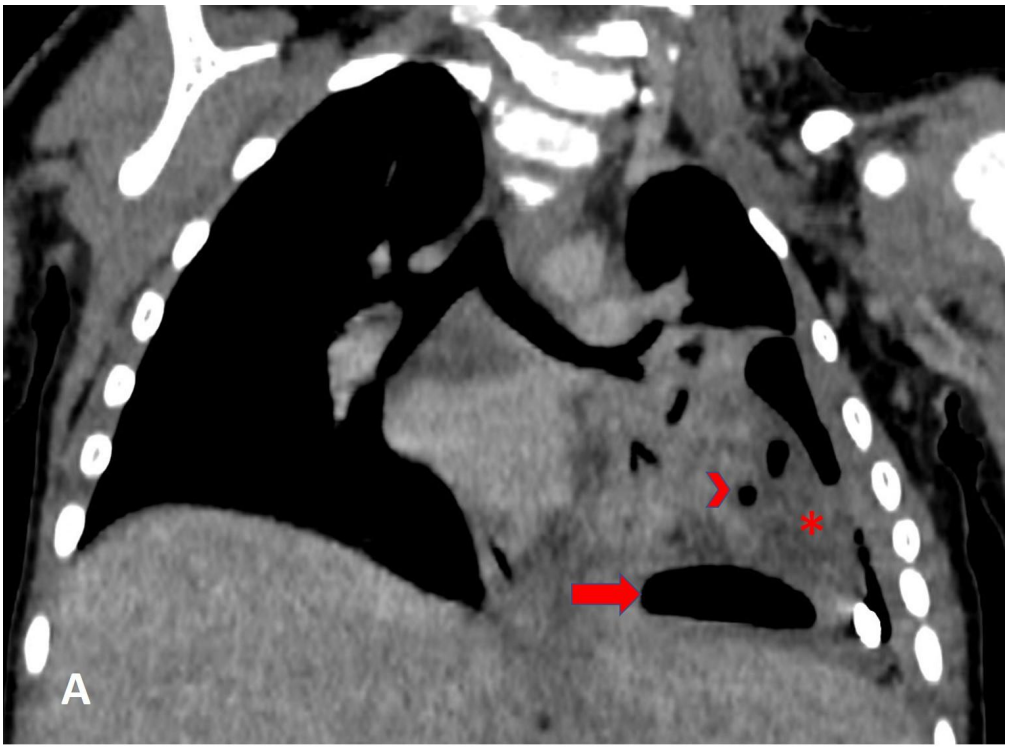
a



Description: CXR taken a few days following left chest drain insertion, after which the patient's clinical condition failed to improve. Note is made of persistent left lower zone consolidation and a left pleural effusion with areas of lucency suggestive of the presence of gas. **Origin:** Medical Imaging Department, Mater Dei Hospital, Malta, 2019

Figure 3

a



Description: Coronal contrast-enhanced CT of the chest in soft-tissue (A) and lung-window (B) setting. There is complete consolidation of the left lower lobe of lung with no aeration, multiple small pockets of gas (arrowheads) and absent enhancement of a large portion of the involved consolidated parenchyma (asterisk). There is gas within the pleural space surrounding the drain, together with a pocket of air in the left subpulmonic location (arrow). **Origin:** Medical Imaging Department, Mater Dei Hospital, Malta, 2019

b

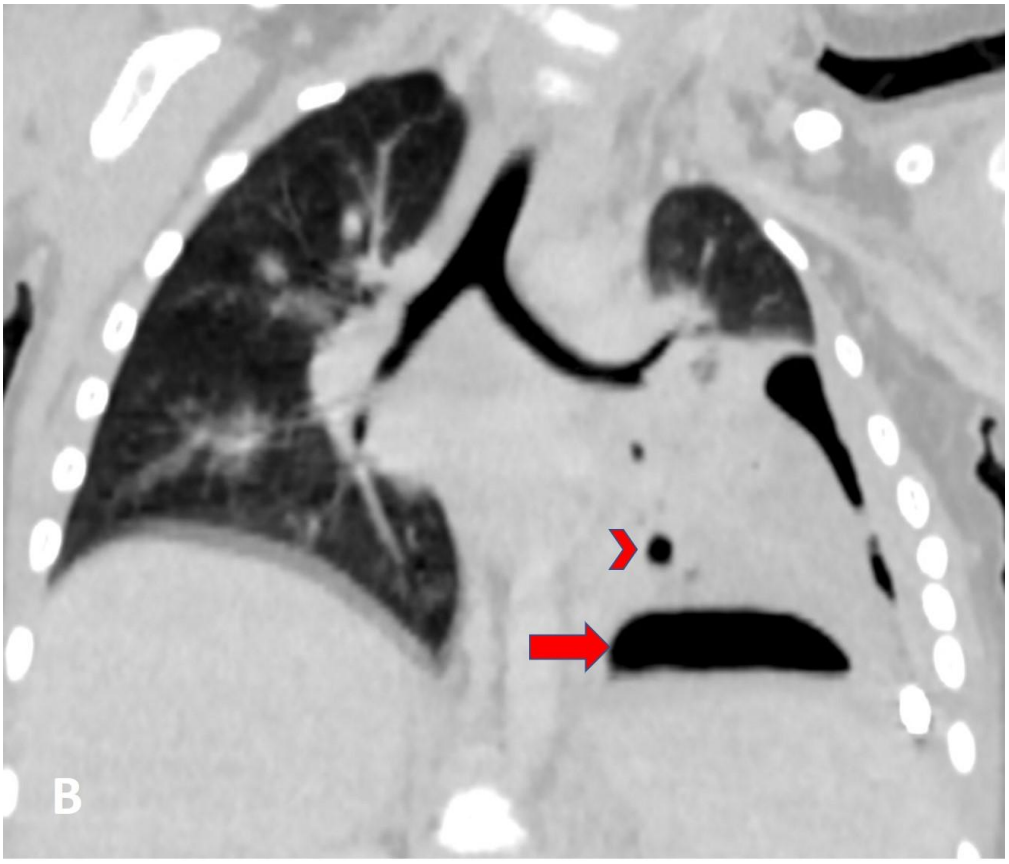


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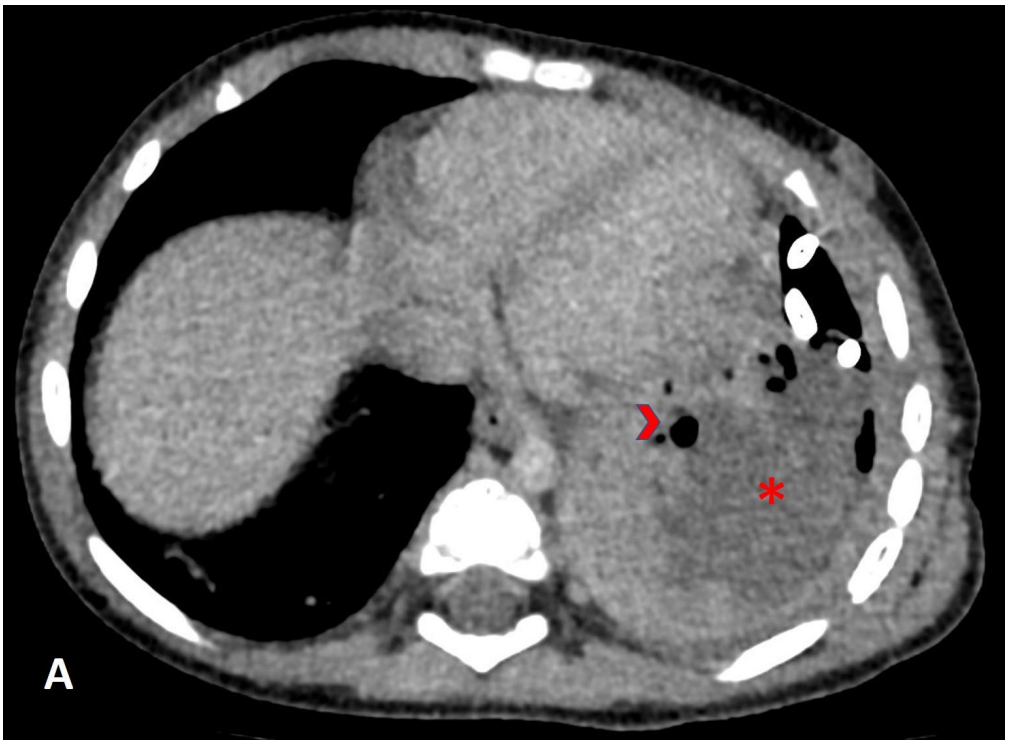
Figure 4

a



Description: Axial contrast-enhanced CT of the chest in soft-tissue (A) and lung-window (B) setting. Note is again made of left lower lobe consolidation with small pockets of gas (arrowheads) and absent enhancement of a large portion of the involved consolidated parenchyma (asterisk). There is gas within the pleural space surrounding the drain. **Origin:** Medical Imaging Department, Mater Dei Hospital, Malta, 2019

b

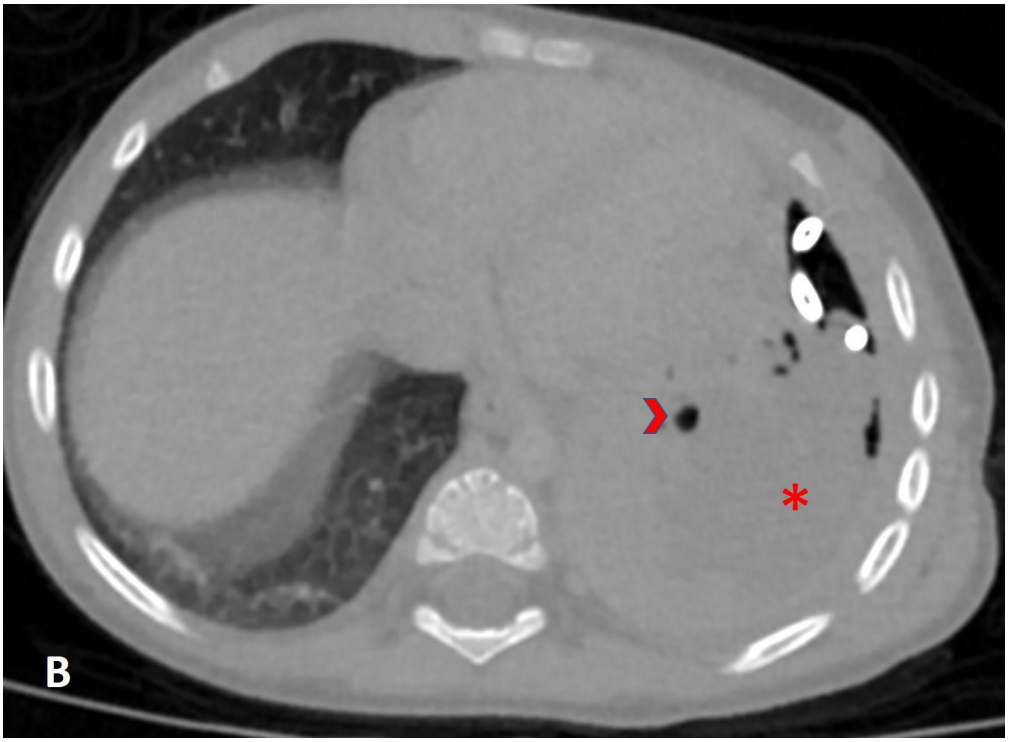


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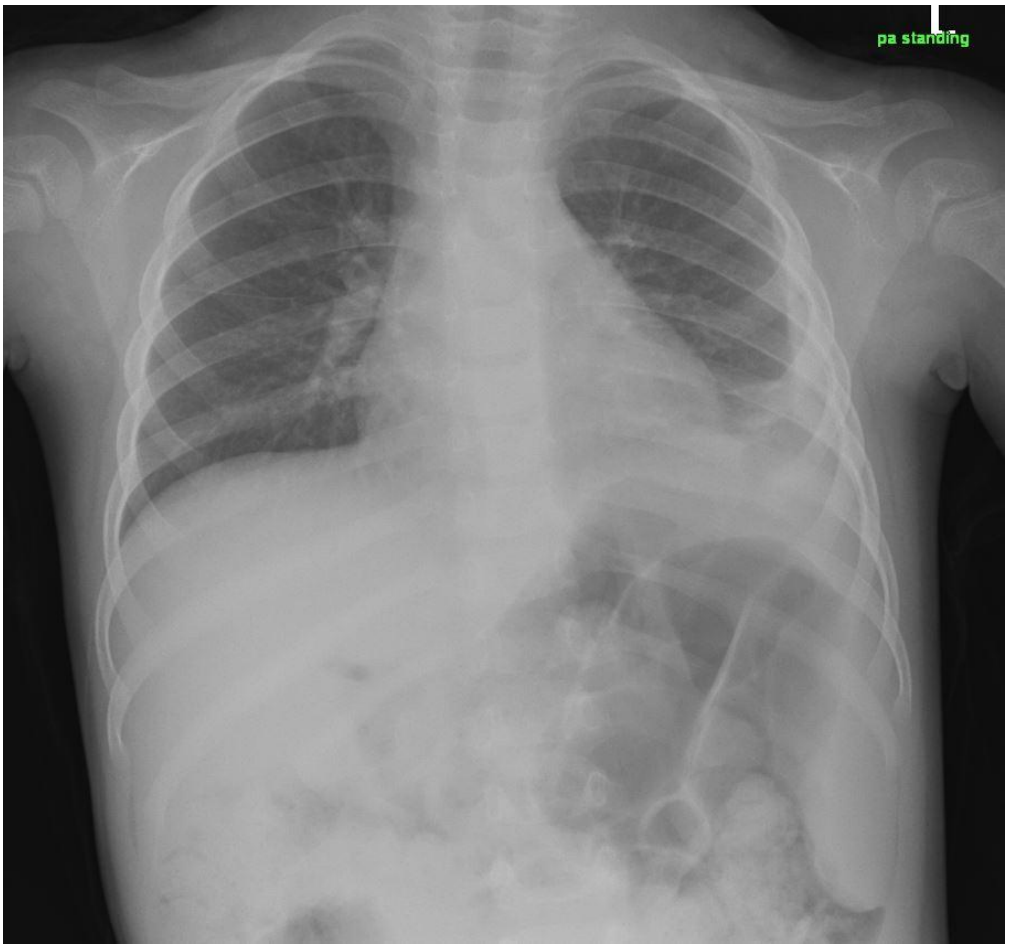
Figure 5

a



Description: CXR taken one week following discharge demonstrating resolved left lower pneumonia with residual post-inflammatory scarring. **Origin:** Medical Imaging Department, Mater Dei Hospital, Malta, 2019