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Case Report

Necrotizing Pneumonia in an Infant, Case Report

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Abstract

We are reporting a 2-year-old boy, who had a febrile illness progressed to respiratory manifestations of worsening breathing pattern and hypoxia, physical examination reviled decrease air entry on the Rt side with crepetations, chest xray showed signs of bronchopneumonia with parapneumonic pleural effusion.

Sever complicated community acquired pneumonaia with parenchymal destruction as a picture of necrotizing pneumonia.

Keywords: *Community Acquired Pneumonia CAP; Necrotizing Pneumonia NP; Empyema; Pleural Effusion*

Introduction

Necrotizing pneumonia is an uncommon severe form of community-acquired pneumonia characterized by rapid progression of consolidation to necrosis and cavitation which may lead to pulmonary gangrene.

Destruction of lung parenchyma, is often accompanied by empyema and bronchopleural fistula Necrotizing pneumonia usually follows pneumonia caused by particularly virulent bacteria S. pneumoniae (especially serotype 3 and serogroup 19) is the most common cause of necrotizing pneumonia IT is also may occur with S. aureus and group A Streptococcus and has been reported due to M. pneumoniae, Legionella, and Aspergillu Clinical manifestations of necrotizing pneumonia are similar to those of uncomplicated pneumonia, but they are more severe

- Most children with NP are young, aged < 5 years, and have been healthy previously
- Clinical features are those of pneumonia with fever, cough, chest pain, tachypnea
- Persistent high-grade fever, sick looking, respiratory distress in desipt of good coverage of antibiotic
- Radiographic signs of a non-responding or progressive pneumonia

- Most (63-100%) have an accompanying PPE or empyema, while BPF diagnosed by either a pneumothorax on chest radiograph or persistent (> 24 h) gas leaks from chest tubes
- Associated with elevated inflammatory markers, including high peripheral white blood cell counts in PNP and C-reactive protein levels exceeding 100 mg/L, while mild-to- moderate anemia and hypoalbu- minemia are also common
- Chest signs may include bronchial breathing, the stony dullness of a pleural effusion and possibly signs of mediastinal shift.

Cases of PVL-positive staphylococcal necrotising pneumonia are characterised by high fever (> 39oC), increased risk of haemoptysis and purulent expectoration when compared to non- PVL staphylococcal pneumonia. In addition, there is often a history of recent S. aureus infection either in the affected individual or close family contacts. There may also be a history of preceding influenza infection.

Necrotizing pneumonias occur infrequently in children but may be associated with significant morbidity. If not adequately treated, necrotizing pneumonia may lead to complications including bronchopleural fistula, empyema, respiratory failure, and septic shock.

Antibiotic therapy alone may not be enough to alter the course of the infection, and regimens, adjunctive therapies like intravenous immunoglobulins, surgery may be required to alter the course of the disease.

We present the case of a 16-month-old child with fever and cough that progressed in form of increase work of breathing. An initial plain radiograph of the chest demonstrated lobar pneumonia. Ultimately, computed tomography of the chest revealed a consolidation with atelectatic bands and cavitation in right middle and lower lobe. findings suggestive of progressive parenchymal destruction lung. We review the literature and describe the clinical presentation, diagnosis, microbiological etiology, and management of necrotizing pneumonia in children.

Important aspects of the physical examination in a child with suspected pneumonia

*For young infants: Ability to attend to the environment, feed, vocalize, and be consoled. ¶ World Health Organization definitions of tachypnea according to age are as follows: < 2 months: > 60 breaths/min; 2 to 12 months: > 50 breaths/min; 1 to 5 years: > 40 breaths/min; ≥ 5 years: > 20 breaths/min

Physical examination feature	Possible significance
General appearance (state of awareness, cyanosis) *	Most children with radiographically confirmed pneumonia appear ill
Vital signs	
Temperature	Fever may be the only sign of pneumonia in highly febrile young children; however, it is variably present and nonspecific
Respiratory rate	Tachypnea¶ less predictive of radiographically confirmed pneumonia than hypoxemia or increased work of breathing Tachypnea correlates with hypoxemia Absence of tachypnea helps to exclude pneumonia
Degree of respiratory distress	Respiratory distress is more specific than fever or cough for lower respiratory infection
Tachypnea	Described in section on “Vital signs”
Hypoxemia	Predictive of pneumonia
Increased work of breathing:	

Retractions	More common in children with pneumonia than without; absence does not exclude pneumonia
Nasal flaring	More common in children with pneumonia than without; absence does not exclude pneumonia
Grunting	Sign of severe disease and impending respiratory failure
Accessory muscle use	Sign of severe disease
Head bobbing	Sign of severe disease
Lung examination	
Cough	Nonspecific finding of pneumonia
Auscultation	Findings suggestive of pneumonia include crackles (rales, crepitations), decreased breath sounds, bronchial breath sounds, egophony, bronchophony, and whispered pectoriloquy Wheezing more common in viral and atypical pneumonias
Tactile fremitus	Suggestive of parenchymal consolidation
Dullness to percussion	Suggestive of parenchymal consolidation or pleural effusion
Mental status	Altered mental status may be a sign of hypoxia

Table 1: *Important aspects of the physical examination in a child with suspected pneumonia.*

Case Presentation

This is 2-year-old previously healthy, presented to the emergency department with a chief complain of fever and cough for five days duration and difficulty of breathing for couple of days. Prior to the presentation, patient was seen in a pediatric clinic and presecribed oral antibiotics, in which he was complaint on and didn't improve, his fever did not subside, his symptoms was not improving, rather were worsening.

Evaluation up on presentation, clinically, patient was tachypnic and ill looking, having troubles to breath and showing signs of respiratory distress in form of intercostal and subcostal retractions. By auscultation, there was significant decrease air entry on the Rt side with crepetations all over the chest more on trhe Rt side, as well as stony dullness during percussion.

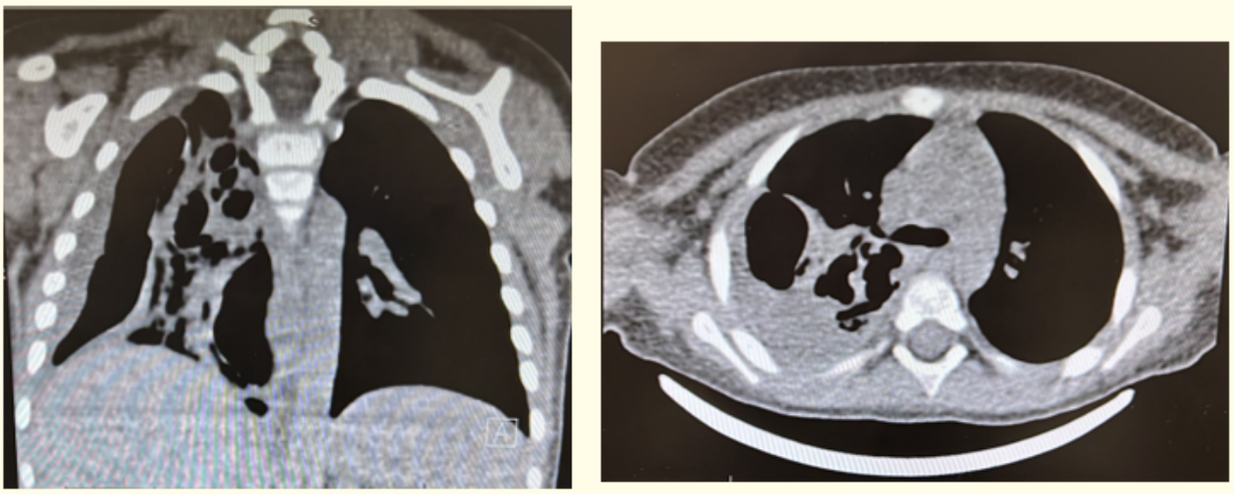

Figure 1: *His first chest radiograph.*

Patient was admitted with an initial impression of bronchopneumonia for respiratory support and chest infection management. His course during ICU was as following, patient was covered by broad spectrum antimicrobial therapy in addition to non-invasive ventilation of high flow nasal cannula HFNC, chest drain was inserted to drain his Rt sided pleural effusion which reveild pus collection and empyema.

Figure 2: *Xray follow up.*

Xrays series was showing complicated pneumonia, necrotizing pneumonia, with right sided pleural effusion vs empyema with right side spontanously pneumothorax s\p right sided chest tube insertion.

Patient was maintaining his oxygen saturation and gas exchange all through his ICU stay, additionally he was maintaining his hemodynamics and organ fuctions.

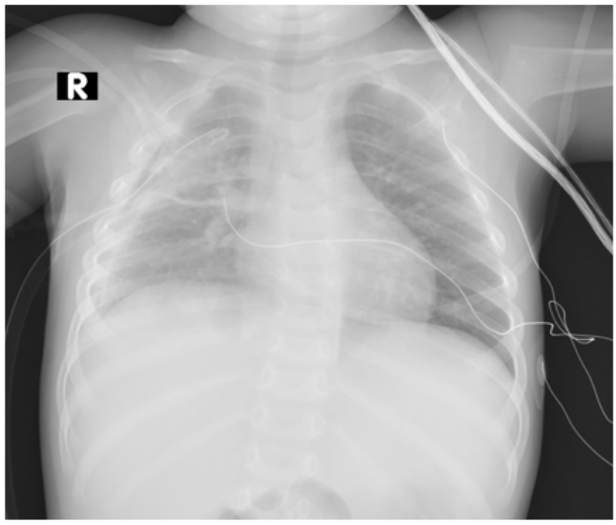

Figure 3: *Xray post chest tube insertion.*

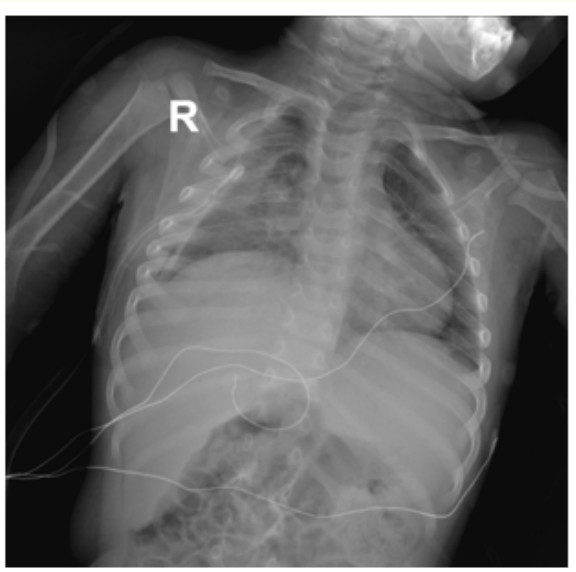

Figure 4: *Xray follow up.*

Furthermore, the patient responded to the provided management, his fever subsided after few days of draining his pleural effusion and his inflammatory markers came dawn, his chest xrays was improving as well, he was relatively in stable condition, started to breath on his own without the assistant of the ventilation device and his hypoxia recovered.

Plan of care was full antibiotics course for four weeks duration.

Blood Cultures, Pleural fluid cultures didn't grow any organism.

COVID19 swab was negative

Respiratory viruses panel came to be negative

Immunological workup came to be negative as well [1-12].

	On admission	At the peak of the illness	After chest tube drainage
WBC	12 X 10^3/uL	34.9 X 10^3/uL	14.5 X 10^3/uL
HGB	10.6 g/dL	10.7 g/dL	10.1 g/dL
PLATELET	326 X 10^3/uL	1133 X 10^3/uL	750 X 10^3/uL
NEUT COUNT	8.8 X 10^3/uL	21.4 X10^3/uL	6.34 X 10^3/uL
NEUT %	43 %	61%	73 %
LYMPH COUNT	1.95 X 10^3/uL	9.85 X 10^3/uL	6.5 X 10^3/uL
LYMPH %	16.2 %	28.2 %	45.1 %
ESR	70 mm/Hour	93 mm/Hour	54 mm/Hour
FIBRINOGEN	6 g/L	2.5 g/L	3.7 g/L
D-DIMER	9.1 ug\ml	10.6 ug\ml	5.9 ug\ml

Table 2: *Renal lytes, liver panel, coagulation and blood gas all were maintainable within normal all through admission.*

Discussion

Necrotizing pneumonia is a sever complication of CAP. It's usually caused by virulent bacteria. The most identify organism that cause necrotizing pneumonia is S. pneumoniae Clinical presentation are more sever with longer duration compared to uncomplicated pneumonia. The radiological investigation includes ultrasonography, chest radiograph or contrast-enhanced computed tomography if the diagnosis remains uncertain. Our patient showed similar coarse. He was presented with symptoms of Fever, cough, runny nose for 3 day then progress in form of increase work of breathing Associated Decrease activity and feeding for 2 days he has initially persistent high grade fever more than 39 despit he is on good coverage of antibotic by cefotaxime, vancomycin and antiviral, his clinical respiratory condition improved with normal VBG but chest x ray showed worsening in right side of lung with total white lung ? conslidation vs pleural effusion with increase inflammatory marker Chest CT done and finding suggestive of parenchyma destruction AND necrotizing pneumonia chest tube insertion with pus sample was send for culture chest X-ray showed significant improvment after chest tube No organism was identified from the pus collection from our patient As the necrotizing pneumonia is a sever complication but still there is no enough reports about the cases, epidemiology and progress of the patients multiple researches are needed to help identify any possible risk factor Comparing to other case report by. Yaron Ivan, rt al. in 2017 our patient had some similarities on which prolong symptoms with chest ct finding confirming the diagnosis.

The Light's Criteria Rule is a traditional method of differentiating transudates and exudates that measures serum and pleural fluid protein and LDH

According to the traditional Light's Criteria Rule, if at least one of the following three criteria is fulfilled, the fluid is defined as an exudate

- Pleural fluid protein/serum protein ratio greater than 0.5, or
- Pleural fluid LDH/serum LDH ratio greater than 0.6, or
- Pleural fluid LDH greater than two-thirds the upper limits of the laboratory's normal serum LDH.

Clinical features of mild pneumonia	Clinical features of severe pneumonia
Temperature < 38.5°C (101.3°F)	Temperature ≥ 38.5°C (101.3°F)
Mild or absent respiratory distress: Increased RR, but less than the age-specific RR that defines moderate to severe respiratory distress Mild or absent retractions No grunting No nasal flaring No apnea Mild shortness of breath	Moderate to severe respiratory distress: RR >70 breaths/minute for infants; RR >50 breaths/minute for older children Moderate/severe suprasternal, intercostal, or subcostal retractions (< 12 months) Severe difficulty breathing (≥ 12 months) Grunting Nasal flaring Apnea Significant shortness of breath
Normal color	Cyanosis
Normal mental status	Altered mental status
Normoxemia (oxygen saturation ≥ 92 percent in room air)	Hypoxemia (sustained oxygen saturation < 90 percent in room air at sea level)
Normal feeding (infants); no vomiting	Not feeding (infants) or signs of dehydration (older children)
Normal heart rate	Tachycardia
Capillary refill < 2 seconds	Capillary refill ≥ 2 seconds

Table 3: *Severity of community-acquired pneumonia in infants and children.*

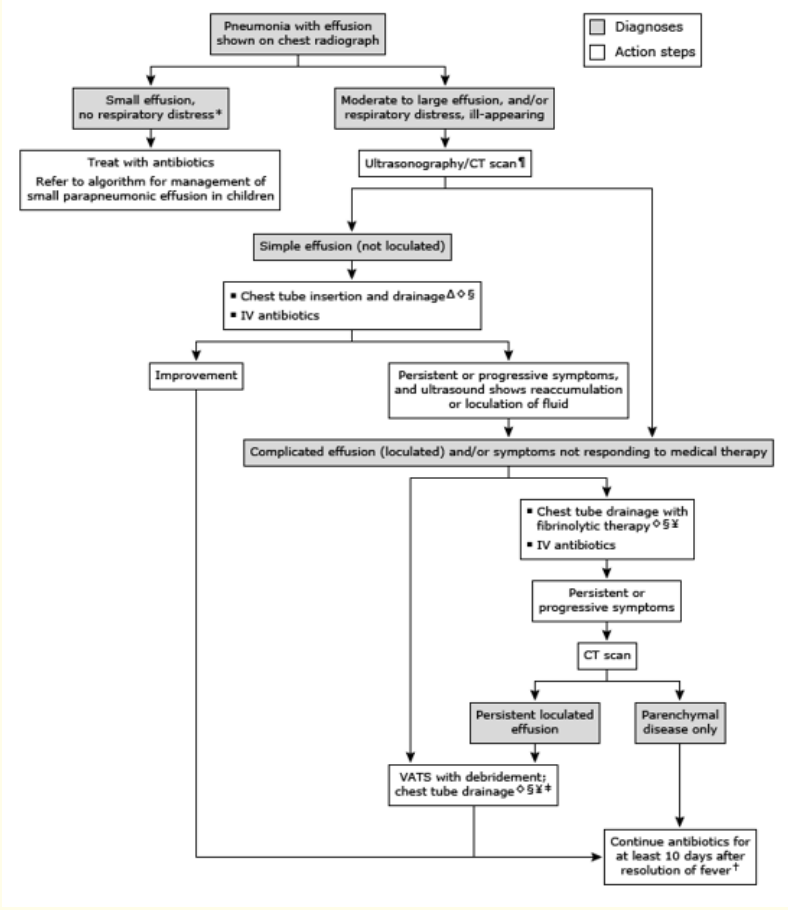

Figure 5: *Approach to the management of pneumonia with a moderate or large parapneumonic effusion in children.*

CT: computed Tomography; IV: intravenous; VATS: video-assisted thoracoscopic surgery.
* A small effusion is defined as < 1 cm on a lateral decubitus radiograph or one that opacifies less than one-fourth of the hemithorax [1].

¶ Ultrasonography is generally preferred over CT for evaluation and monitoring of pleural effusions. CT should be reserved for complicated cases in which further characterization of parenchymal disease is needed or ultrasonography is inadequate [2].

Δ An alternative to chest tube placement for patients who are clinically stable is a trial of empirically selected IV antibiotics for 24 to 72 hours.

◊ Whenever thoracentesis or drainage is performed, the fluid should be cultured and IV antibiotics started; the choice of antibiotics should be reevaluated depending on culture results.

§ If a chest tube is placed, small-bore tubes (< 14F) should be used, when possible, even for loculated effusions. Small-bore chest tubes are effective with fibrinolytics and cause less discomfort to the patient [2].

¥ For initial treatment of a complicated effusion, most experts agree that either pleural drainage with fibrinolytics or VATS is a reasonable first step. The choice may be influenced by available expertise, cost considerations, and patient preferences.

‡ Patients who fail to improve after VATS may require open thoracotomy to remove the pleural rind and evacuate pyogenic material ("decortication").

† Antibiotics may be changed from IV to oral route when the child has been afebrile for 2 to 5 days.

Conclusion

- Necrotizing pneumonia is a serious complication of community acquired pneumonia CAP.
- Necrotizing pneumonia should be considered in a child with prolonged high-grade fever or septic appearance.
- Treatment of necrotizing pneumonia requires a prolonged course of antibiotic therapy. The duration is determined by the clinical response but is usually a total of four weeks or two weeks after the patient is afebrile and has improved clinically. Interventional procedures should be performed cautiously in children with necrotizing pneumonia.

Consent

Written consent was taken from the parents for approval of case reporting and publishing.

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Conflicts of Interest

None.

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Contribution of Authors

Preparation of first draft: I.M, S.Sh, M.O

Literature review: N.F Z. J, S.S, E.N

Conceptualization: N.F, M.O

Intellectual inputs for improvement of S.Sh, M.O.

Approval of final draft

IM, N.F.

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