

**Case Report**

# Silent Lung Abscess in a Newborn: A Case Report

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**Abstract:** *Background:* Lung abscesses are rare in childhood and very rare in early infancy and neonates. With a predicted incidence of 7 per 1000,000 admissions per year. Furthermore, Neonatal lung abscesses are usually of multi-bacterial etiology. In addition, Risk factors in neonates include prematurity, ventilation, congenital lung malformation, and aspiration. Here, we are reporting a 21 day- old baby, full term, normal vaginal delivery, no history of NICU admission, no resuscitation at birth, group B streptococcus screening is negative, breast feeding, and no respiratory distress at birth, who presented with unusual picture of mild cough and flu without fever or other symptoms, and was diagnosed as a lung abscess, which is probably one of the few cases reported in the literature in neonates. *Case presentation:* A 3-week-old boy presented with unusual symptoms of cough, flu, without fever, or other manifestations. The Diagnosis of lung abscess was based on chest CT scan. Empirically treated with intravenous antibiotics was started. Then, patient was discharged from the hospital with an outpatient follow-up. At the time of discharge, he had reassuring vital signs and a normal physical examination. At the follow-up visit after one week, no clinical symptoms were reported and the physical examination was normal. *Conclusion:* unexpected case of lung abscess in neonates is very rare and distinctive condition, so our recommendations for pediatricians are to be vigilant about the silent presentation of infection in neonates.

**Keywords:** Lung Abscess, Neonatal Infection, Sepsis

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## 1. Background

Lung abscess is rare in childhood, with a predicted incidence of 7 per 1000,000 admissions per year. [1, 2] It is a bounded, thick-walled cavity in the lung tissue that contains

purulent material due to inflammation and necrosis of the affected lung parenchyma [3, 4]. Lung abscesses in pediatric patients are divided into two types: primary, in which predisposing factors are not present, and secondary, where, there are underlying predisposing factors, either systemic or localized in the lungs [3]. Other classifications of lung abscess

include, according to the site, multiloculated and uniloculated, according to infection resource, hematogenous or result from aspiration, and finally according to the organisms, aerobic and anaerobic [5]. Furthermore, it can also be divided depending on the period of the disease into an acute abscess, which lasts four weeks or less, or chronic abscess which continues more than four weeks [6, 7]. Primary lung abscesses are mainly caused by *Staphylococcus aureus* or *Streptococcus pneumoniae* [5]. In contrast, secondary lung abscesses can result from anaerobes (27%), *Staphylococcus aureus* (13%), *Pseudomonas aeruginosa* (13%), *Haemophilus influenzae* (7%), *Streptococcus pneumoniae* (7%), [4], *Escherichia coli*, and *Klebsiella* [6]. Moreover, Secondary lung abscesses are due to many structural or functional lung illnesses, such as congenital lung abnormalities, cystic fibrosis, ciliary disorders, aspirations, immunodeficiency, and infections [3]. Finally, lung abscesses are rarely caused by tuberculosis [8]. In early infancy, Lung abscess is very rare [2, 9]. In the abscess, the coagulative necrosis of one or more areas of the lung is distinctive, and there are more predilections to the right lung. So, abscesses post-pneumonia are common; nevertheless, in infants and neonates, de novo abscesses have also been reported [9]. Except for cases complicated by dissemination, recovery is the rule with suitable antibiotics [10].

Moreover, lung abscesses in neonates are very rare [11] and usually have a multi-bacterial etiology [12, 13]. Risk factors include prematurity, ventilation, congenital lung malformation, and aspiration. Direct culture by percutaneous needle aspiration under either sonography [14], or computed tomography guidance [12] is recommended to start early suitable intravenous therapy and hasten recovery, avoid surgery options, and prevent additional complications [14].

New generations of antibiotics have radically reduced the incidence of lung abscesses in children [15]. Here, we are reporting a 21 day- old baby with a lung abscess, which is probably one of the few cases reported in the literature in neonates.

## 2. Case Presentation

A 3-week-old boy-full-term, vacuum-assisted vaginal delivery, no NICU admission, and negative screening for GBS in the mother is presented to the pediatric emergency center on

October 11, 2022, with a one-day history of cough flu. He did not have any other symptoms such as fever, poor feeding, vomiting, rapid breathing, diarrhea, history of trauma, or skin rash. The newborn did not have any risk factors for COVID-19. The perinatal history was uneventful. His weight, length, and head circumference were age-appropriate; he was on formula feeding. At the time of presentation to the emergency center, the patient's temperature was 37.4 °C rectally, heart rate was 138 beats per minute, blood pressure was 88/53mm Hg, respiratory rate was 46 breaths/min, and oxygen saturation was 99% on room air. Physical examination revealed a normal infant. Pulmonary, cardiac, neurological, and abdominal examinations were normal, and there was no evidence of acute otitis media on otoscopic examination, he was treated as common cold.

After four days on October 15, revisited PEC with fever (38.4 rectally) cough flu, with normal clinical examination, full septic work up was performed and, Laboratory investigations were as follows: COVID-19 PCR was negative, complete blood count was normal at  $15.1 \times 10^3$  white blood cells (wbcs)/ $\mu$ L (normal  $6-16 \times 10^3$  WBC/ $\mu$ L) with 46.6% neutrophils, and C-reactive protein level of 1 mg/dl (normal 0–5mg/L). The patient's respiratory virus PCR panel was negative. The urinalysis results were negative for leukocyte esterase and nitrite. Lumbar puncture was performed and the cerebral spinal fluid was clear, colorless with 1 RBC/uL (normal 0–2 RBC/uL), 2 WBC/uL (normal 0–5 WBC/uL), glucose of 3.8 mmol/L (serum glucose of 5.5 mmol/L), and protein of 0.24 gr/L (normal 0.15–0.45 gm/L), gram stain showed no organism. The patient was treated empirically with intravenous antibiotics (ceftriaxone), which were discontinued after negative CSF, urine, and blood culture results.

After one week, the patient returned with mild cough without fever; physical examination was normal, chest clear, and no respiratory distress. Due to recurrent visits to PEC, patient was admitted to the hospital for further investigations, which were as follows: COVID-19 PCR was negative; complete blood count was elevated at  $43.5 \times 10^3$  white blood cells (wbcs)/ $\mu$ L (normal  $6-16 \times 10^3$  WBC/ $\mu$ L) with 70.5% neutrophils, and C-reactive protein level of 90 mg/dl (normal 0–5 mg/L). The patient's respiratory virus PCR panel was negative. The urinalysis results were negative. CSF test results were normal. (The full investigation results are provided in Appendix Table 1).

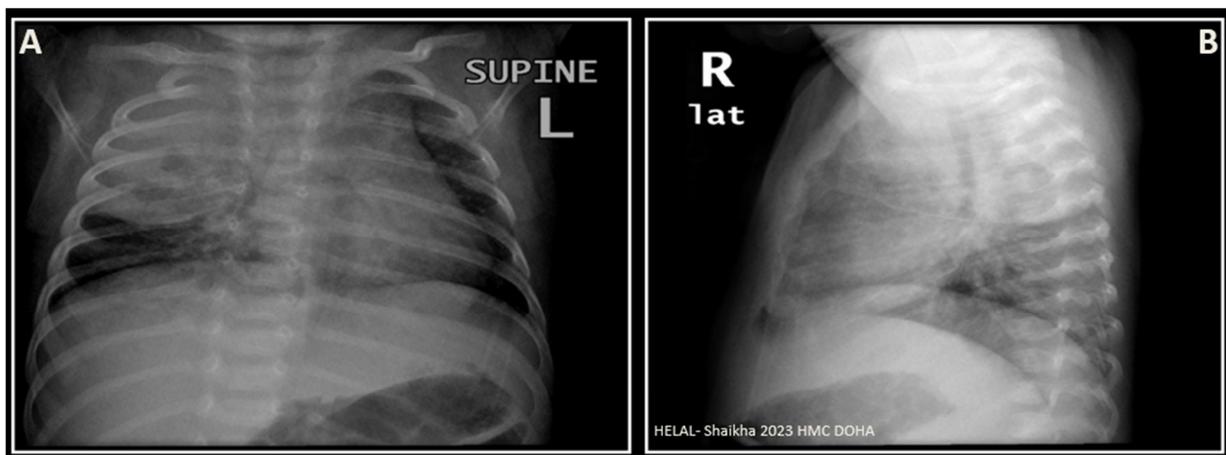
**Table 1.** Vital signs, Radiology and laboratory findings.

Investigations	Value	Normal Reference Range
Blood		
WBC	$43.5 \times 10^3$ WBC/uL	$6-16 \times 10^3$ WBC/uL
Hb	11.7 gm/dL	11.1-14.1 gm/dL
Platelets	$747 \times 10^3$ Plat/uL	$200-550 \times 10^3$ Plat/uL
CRP	109.2 mg/L	0-5 mg/L
Neutrophils	30.7 WBC/ uL	1000-7000 WBC/ uL
lymphocytes	$6.2 \times 10^3$ WBC/uL	$3.5-11 \times 10^3$ WBC/uL
Blood culture	No growth	No growth
Blood Glucose	5.5 mmol/L	3.5 - 5.5 mmol/L
Peripheral smear	Mild normochromic normocytic anemia with slight anisocytosis, few ovalocytes, spherocytes and mild rouleaux formation. Moderate neutrophilic leukocytosis with toxic features, few reactive lymphocytes and occasional atypical forms are seen. Moderate thrombocytosis.	

Investigations	Value	Normal Reference Range
<b>General Immunology</b>		
IgE	21.7 Kunits/L	0.0 – 16.4 Kunits/L
IgM	0.85 gm/L	0.06 – 0.84 gr/L
IgA	1.09 gm/L	0.0 – 0.40 gr/L
IgG	16.47 gm/L	1.4 – 5.33 gr/L
IgG sub1	11.49 mg/L	1,940 - 8,420 mg/L
IgG sub2	2.208 mg/L	2.25 – 3.0 mg/L
IgG sub3	1.614 mg/L	186 – 853 mg/L
IgG sub4	103 mg/L	5.0 – 784 mg/L
<b>Immunology few cytometry</b>		
CD3%	71.90	60 - 85
CD3 Abs Count	3819	2300 - 7000
CD3/CD4 %	42.7	41 – 68
CD3/CD8 %	25.40	9 – 23
CD4/CD8 Ratio	1.66	
Lymph Sub Report	Normal lymphocyte subset distribution	
<b>CSF</b>		
color	colorless	colorless
appearance	clear	clear
WBC	5 WBC /uL	0-5 WBC /uL
RBC	1 RBC /uL	0 -2 RBC /uL
Glucose	2.9 mmol/L	60-80% of Blood Glucose
Protein	0.45 gm/L	0.15-0.45 gm/L
Gram stain	No Organism seen	No Organism seen
Culture	No Growth	No Growth
Virology studies	Negative	Negative
<b>Urine</b>		
WBC	0.0 WBC /uL	0 – 9 WBC /uL
RBC	6.0 RBC /uL	0-5 RBC /uL
Urine Culture	No Growth	No Growth
COVID-19 PCR	Negative	Negative
Respiratory Viruses PCR	Negative	Negative
Chest Ultrasound	Features of consolidation of the right upper lobe with heterogenous hypoechoic areas; showing no appreciable vascularity (organizing areas of liquefaction necrosis. No appreciable mobile echoes); while the rest of the areas of consolidation showing rather increased vascularity on color Doppler; concerning for organizing necrotizing pneumonia. No appreciable associated Para pneumonic effusion.	
CT chest	There is a 3 x 3x 3 cm well defined abscess with air pockets in the right upper lobe with air fluid level. There is adjacent upper pole apical segment consolidation with multiple pneumatoceles. Both hila are unremarkable. Mediastinal vessels are normal. There is no hilar, mediastinal, axillary and supraclavicular lymphadenopathy. There is no pleural and pericardial effusion. Thymus is present.	
Chest X-Ray	Right upper lobe expansile consolidation with areas of ill-defined cavitation, suggestive of abscess formation. No pleural effusion or cardiomegaly.	

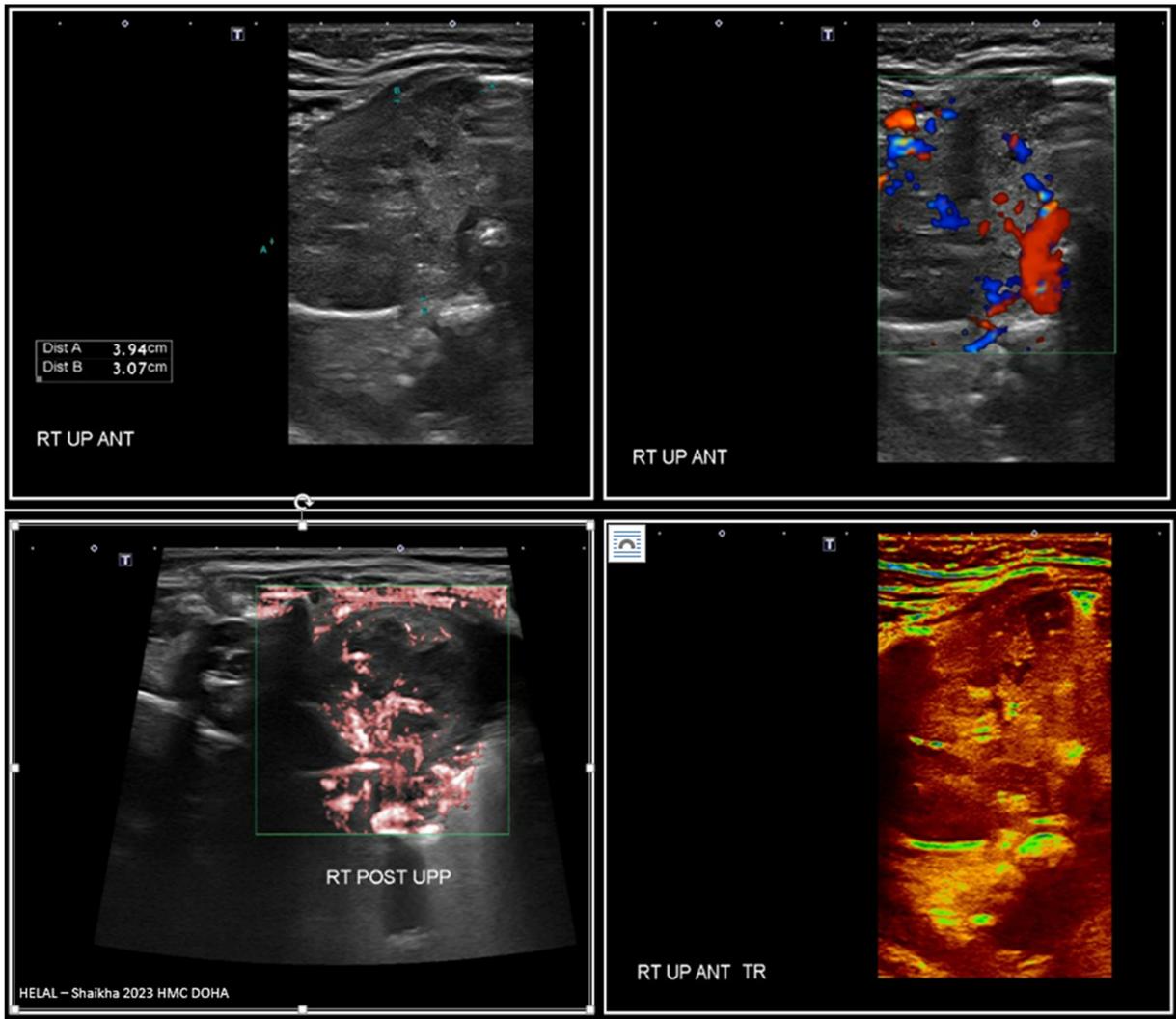
A peripheral smear revealed; mild normochromic normocytic anemia, moderate neutrophilic leukocytosis, and moderate thrombocytosis.

Chest radiography (anterior-posterior and lateral) showed right upper lobe expansile consolidation with areas of ill-defined cavitation, suggestive of abscess formation (Figure 1).



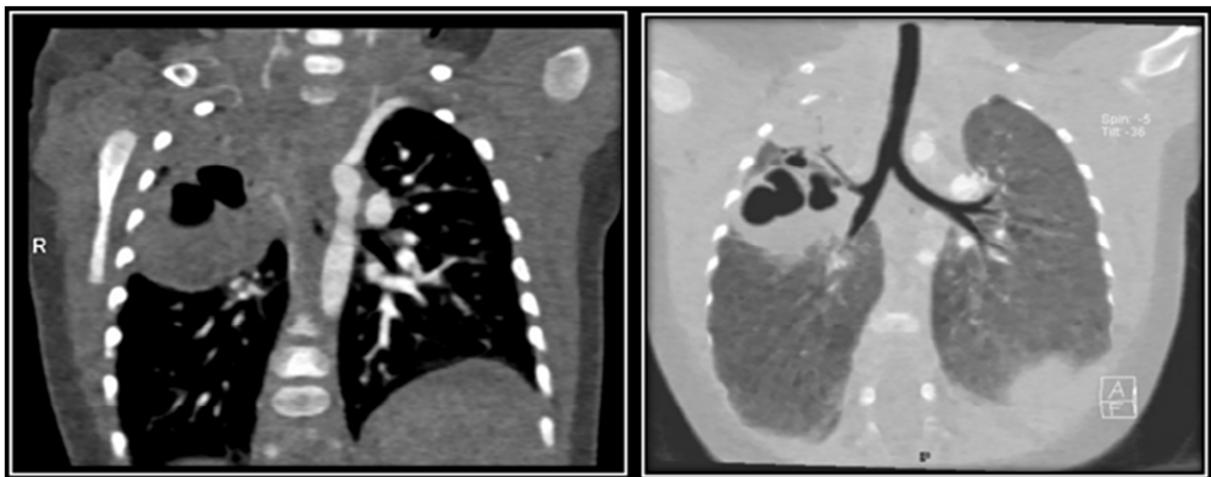
**Figure 1.** A: Anterior Posterior Chest radiograph demonstrates a consolidated lesion of the right upper lobe. B: Lateral chest X-Ray.

Ultrasound of the thorax and pleural cavity showed features of consolidation of the right upper lobe with heterogeneous hypoechoic areas (Figure 2).



**Figure 2.** Ultrasound of Thorax and pleural cavity: Features of consolidation of the right upper lobe with heterogenous hypoechoic areas; showing no appreciable vascularity (organizing areas of liquefaction necrosis. No appreciable mobile echoes); while the rest of the areas of consolidation showing rather increased vascularity on color Doppler; concerning organizing necrotizing pneumonia.

Thoracic CT showed a 3 x 3x 3 cm well-defined abscess with air pockets in the right upper lobe with air-fluid level (Figure 3).





**Figure 3.** Computed tomography scan of chest showing thick walled cavity lesion with air-fluid levels and air pockets in the right upper lobe.

The patient was empirically treated with intravenous antibiotics (ceftriaxone and clindamycin) for 14 days, followed by oral administration (cefixime and clindamycin) for 2 weeks. At the time of discharge, he had reassuring vital signs, normal physical examination, and no fever.

On follow-up after 1 week, he underwent a normal physical examination, and no clinical symptoms were reported.

### 3. Discussion

A Lung abscess is a localized infection with central necrosis and suppuration of the lung parenchyma, surrounded by a thick wall of infected and inflammatory tissue. This process may establish communication with the airway and cause air-fluid levels. Primary lung abscesses occur in healthy children, whereas secondary lung abscesses develop in children with risk factors. Furthermore, primary lung abscesses are usually solitary, whilst secondary abscesses can be solitary or multiple. Primary lung abscesses occur predominantly in the right lung; if the abscess is due to aspiration, the upper lobes of either side are commonly involved.

In children lung abscesses mostly develop secondary to bacterial pneumonia [15], and have a very good prognosis either, primary or secondary compared to adults. However, diagnosis is difficult even with advanced investigations.

Common differential diagnoses include infected congenital cystic abnormalities of the lung such as cystic adenomatoid malformation, bronchogenic cyst, and late-presenting congenital right-sided diaphragmatic hernia.

Treatment of lung abscesses is often based on intravenous antibiotics that can cover anaerobic and staphylococcal organisms, and substitution of older therapies such as catheter drainage, pneumonostomy, and sectional surgery [16]. Additionally, in case of incomplete or inadequate response to IV antibiotics, computerized tomography (CT)-guided percutaneous drainage or other surgical interventions may become unavoidable [17, 18]. Finally, the most recent technique of Transtracheal aspiration and drainage could be used [19, 20].

Complications such as pleural hemorrhage, empyema, broncho-pleural fistula, or pneumothorax may occur with all of these procedures.

### 4. Conclusion

In this case, a newborn presented with a rare and distinctive history of mild cough and flu without fever, with normal clinical examination, and good feeding. Blood investigation showed leukocytosis, therefore, chest radiology was performed, which showed right upper lobe consolidation, and intravenous antibiotics were already

started. Synchronously, a chest CT was performed which showed a lung abscess.

Finally, our recommendations for pediatricians are to be vigilant about the silent presentation of diseases in neonates, especially infections.

## Abbreviations

COVID-19: Coronavirus Disease 2019, CT: Computed Tomography, GBS: Group B Streptococcus, NICU: Neonatal Intensive Care Unit, PEC: Pediatric Emergency Center.

## Declarations

### *Ethics Approval and Consent to Participate*

This case report was approved by the Institutional Review Board (IRB) of the Medical Research Center at Hamad Medical Corporation, on 1FT December 2022, approval: ID (MRC-04-22-772), and conducted in full conformance with principles of the “Declaration of Helsinki”, Good Clinical Practice (GCP) and within the laws and regulations of MOPH in Qatar.

All methods were performed in accordance with the relevant guidelines and regulations, and informed consent was obtained.

### *Consent for Publication*

Written informed consent was obtained from the patient's parents for publication of the case details.

### *Availability of Data and Materials*

All data generated or analysed during this study are included in this article. Further inquiries can be directed to the corresponding author.

### *Competing Interests*

The authors declare that they have no competing interests.

### *Authors' Contributions*

MAOH, AN, and FA, Designed the study; SA, DA, WA, LA, and MA collected data.

MAOH, MA, HS, and MQ. Analyzed the data. MAOH, wrote the main manuscript. All authors reviewed and agreed to the published version of the manuscript.

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