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Hemoptysis due to lung abscess in pediatric patient: Diagnostic approach and treatment

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Abstract: Hemoptysis in children is a rare and serious clinical symptom often indicative of significant underlying pathology. We report the case of an 11-year-old girl presenting with recurrent hemoptysis caused by a lung abscess. The patient had a history of recurrent respiratory infections and was initially misdiagnosed with pulmonary tuberculosis, leading to an ineffective treatment regimen. Further diagnostic workup, including contrast-enhanced chest CT and microbiological evaluations, revealed a large lung abscess in the left upper lobe, accompanied by anemia of chronic disease and bacterial infection with Micrococcus lylae. Management included a multidisciplinary approach involving intravenous antibiotics, bronchoscopy, and thoracotomy with decortication and abscess drainage. The patient showed significant clinical improvement post-surgery and antibiotic regimen adjustment. This case highlights the importance of accurate diagnosis, the role of advanced imaging, and the integration of medical and surgical interventions in managing hemoptysis due to lung abscesses in pediatric patients. Early recognition and a comprehensive treatment strategy are critical to preventing complications and ensuring optimal outcomes.

Keywords: *Hemoptysis, Lung abscess, Micrococcus lylae, Multidisciplinary approach, Pediatric, Thoracotomy.*

1. Introduction

Hemoptysis, or coughing up blood, is a serious clinical symptom that can manifest in various pulmonary conditions, including lung abscess. A lung abscess is an infection of the lung parenchyma characterized by necrosis of the tissue and the formation of a cavity filled with pus. This condition can lead to hemoptysis through the mechanism of vascular erosion caused by the inflammatory process or tissue necrosis surrounding the abscess. In children, lung abscesses are relatively rare but are associated with significant morbidity, particularly when accompanied by hemoptysis [1, 2].

The Prevalence of hemoptysis in children is much rarer than in adults, with a prevalence of around 0.1% to 0.5% in hospitalized pediatric patients with pulmonary conditions. In Indonesia, lung abscesses are reported in approximately 10-15% of children hospitalized with severe pulmonary infections, with about 20% of these cases involving hemoptysis [3]. The main causes of lung abscesses include anaerobic bacterial infections, *Staphylococcus aureus*, and *Klebsiella pneumoniae* [4].

A comprehensive diagnostic approach is crucial to identify the source of bleeding and the etiology of hemoptysis. This case report highlights the importance of radiological imaging (CT scan) and other diagnostic procedures such as bronchoscopy and angiography in guiding treatment decisions [1, 3]. A combination of supportive care, antibiotics, and, when necessary, interventional or surgical procedures ensures optimal outcomes [5-7].

Hemoptysis in lung abscesses is rare in the pediatric population, but it carries significant potential for severity. This case report aims to explore the causes of hemoptysis, including vascular erosion resulting from the inflammatory process and necrosis of lung tissue caused by the abscess. A

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2. Case Descriptions

An 11-year-old girl presented to the emergency department (ED), with the main complaint of recurrent coughing up blood approximately 15 cc each time the symptom appeared. The cough and chest pain first began three months ago. The chest pain is worsening when she deep breathing, and sneezing.

The patient had a history of recurrent coughing 1 to 2 times per month accompanied by shortness of breath from the age of 2 to 8 years, without seeking medical attention and resolved with over the counter medication or taking non-prescription medication such as Ambroxol, Promethazine, and Guaifenesin.

On the first month, the patient developed a dry cough that became productive with phlegm after two weeks, accompanied by shortness of breath. After one month of persistent dry cough, the patient experienced her first episode of coughing up blood, with persisted chest pain, along with a fever with a maximum temperature of 38.8°C and decreased with paracetamol. Patient was hospitalized for 8 days. The chest X-ray indicated mass or abscess, from Mantoux test showing induration of 0 mm. The patient was clinically diagnose with pulmonary TB and start anti tuberculosis drugs. After 2 week medication there no clinical improvement and the patient was refer to our hospital.

The patient with clinical symptoms of hemoptysis (10-20 cc), chest pain, and shortness of breath.. GeneXpert sputum test was conducted, showing "MTB not detected." A contrast-enhanced CT scan of the thorax suggestive of an abscess, along with left upper lobe atelectasis.

Figure 1.
A: Chest x-ray AP View; Chest CT scan, B: sagital view; C: coronal view; D: Axial view.

Chest x-ray showed opacity on left upper lobe with border was not clear, size: 12.4x5.3cm. it could be a mass or abscess (A); Chest CT scan showed concsolidation with multiple cavities (B, C, and D) at left upper lobe and atelectasis.

On the second day of observation, the condition of patient was weak she got fever, with continued to coughing with yellowish purulent sputum mixed with blood with rales in the left lung. Laboratory tests showed low serum, low total iron-binding capacity, transferrin saturation at 6.5%, and a blood smear indicating normochromic normocytic anemia, leukocytosis with immature granulocytes, and thrombocytosis with giant platelets. The patient was diagnosed with anemia of chronic disease, with a treatment plan to be initiated after the infection resolved. Anti-tuberculosis medication was discontinued.

On the third day of observation the patient still had fever and continued to complain of a productive cough with traces of blood. The patient underwent bronchoscopy followed by a biopsy. The biopsy results showed the presence of pus, prompting further microbiological and culture examinations. The

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antibiotic and other medications were continued. The patient was referred to thoracic cardiovascular surgery for a planned thoracotomy and left upper lobe lobectomy of the lung.

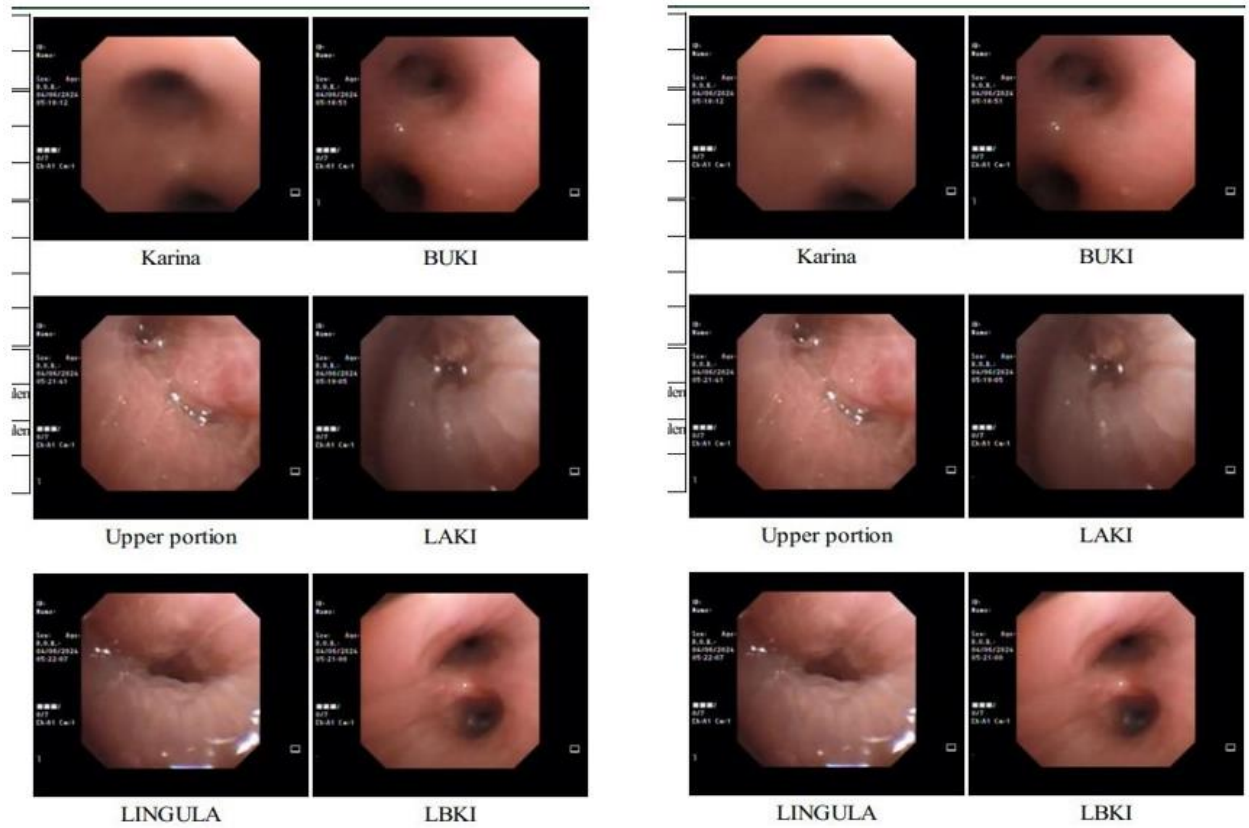

Figure 2.
Bronchoscopy Visually, no large masses, clear obstructions, or signs of severe infection such as abscesses were found.

On the 5th and 6th days of observation the patient had mild fever continued to report coughing with blood, patient going to surgery, after surgery the surgeon performed a pus drainage procedure by inserting a chest tube with water-sealed drainage. The medication regimen was continued. The patient was monitored in the ICU.

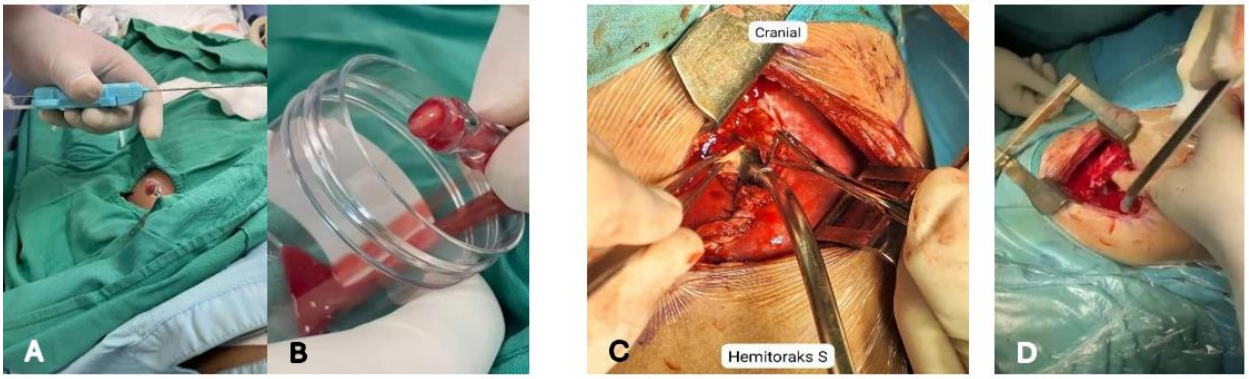

Figure 3.
A, B: FNAB procedure; C, D: Thoracotomy procedure.

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On the 7th day of observation, she still had a low-grade fever and pain after surgery but the patient's cough had improved, with no presence of blood. WSD produced 70-150 ml/day. The pus culture identified a gram-positive microorganism, Micrococcus lylae. Based on the culture sensitivity results, the antibiotic was switched to gentamycin.

Figure 4.
WSD fluid output.

On the 10th to 14th day of observation the patient was feeling much better. Her cough and fever had significantly decreased. She still experienced some pain after chest tube insertion. The production from the WSD decreased to 50-70 ml/day and continued to lessen each day. On the 14th day of observation, the chest tube was removed, and antibiotic treatment was maintained for 14 days. The patient was discharged after completing the antibiotic course.

3. Discussion

Hemoptysis in children with a lung abscess is primarily related to infection, necrosis, and Hemoptysis in children with a lung abscess is primarily related to infection, necrosis, and subsequent damage to the surrounding lung tissues and blood vessels. Lung abscesses are often caused by bacterial infections such as Staphylococcus aureus, Streptococcus pneumoniae, or Klebsiella pneumoniae, leading to significant inflammation and localized necrosis of lung tissue as the lung tissue deteriorates, cavitations (pus-filled cavities) form within the lungs [1].

The inflammation inside an abscess can weaken nearby blood vessels, particularly the bronchial arteries, which have a higher risk of rupturing because they operate under greater pressure than the pulmonary arteries [2]. The rupture of these blood vessels results in bleeding into the airways, causing hemoptysis, where blood is coughed up from the lungs, the severity is depending on the vascular damange [3, 4]. The presence of pus and blood within the airways irritates the lung, triggering a cough

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reflex. The contributing factors such as underlying immune deficiencies or congenital abnormalities, can exacerbate the infection and increase the likelihood of abscess formation and hemoptysis [8].

In pediatric patients, hemoptysis is categorized based on the volume of blood expectorated. It is considered mild if the blood volume is less than 5 ml per episode, moderate 5 to 100 ml within 24 hours, and massive volume exceeds 100 ml in the same time frame.[2] Massive hemoptysis in children is a critical medical emergency potential for severe airway obstruction, acute respiratory failure, hypoxia, and hemodynamic instability resulting from significant blood loss.[4,5] Therefore, rapid assessment and intervention, including airway management, hemodynamic stabilization, and identification and control of the bleeding source, are crucial to improving outcomes in pediatric patients experiencing massive hemoptysis [3].

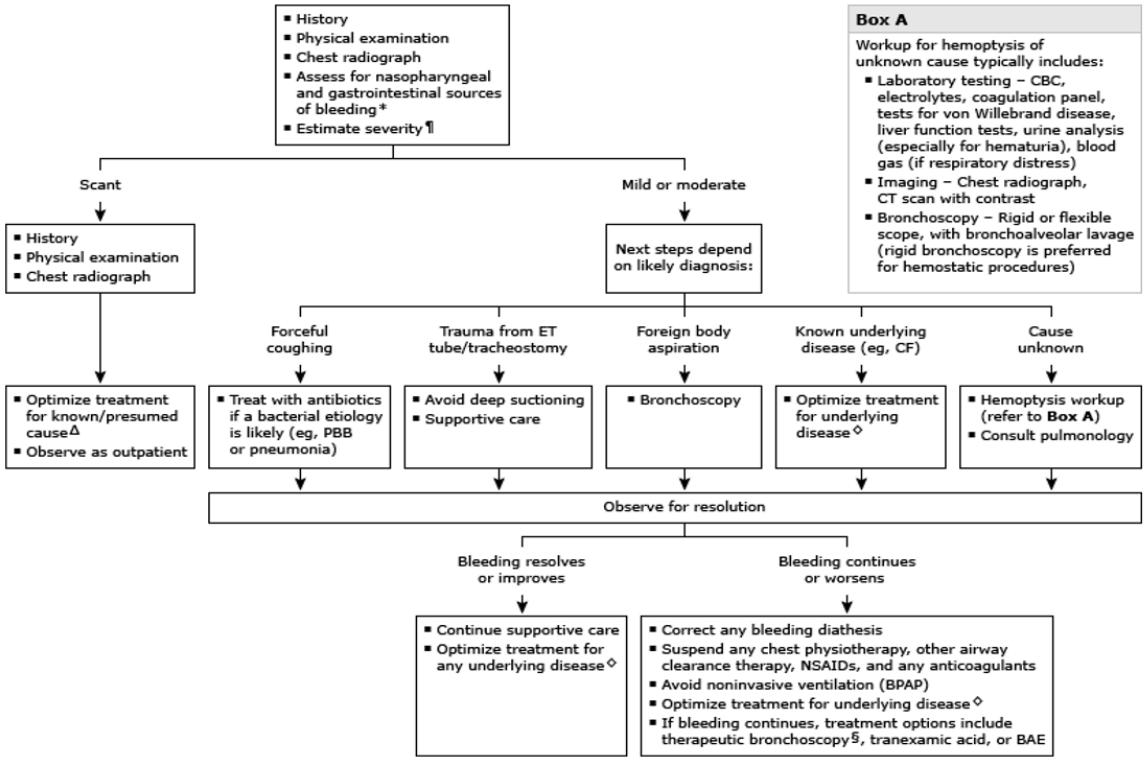

Figure 5.
General approach to evaluation and management of the child presenting with non-life-threatening hemoptysis.[6]

The flowchart provides a detailed and systematic approach to the diagnosis and management of hemoptysis in pediatric patients, guiding clinicians through each step based on the severity and potential causes of the condition [5].

An estimation of the severity of hemoptysis is critical, as it will determine the subsequent management steps. In this case, the patient falls into the moderate category (between 5 and 100 ml in 24 hours). The hemoptysis should still be considered serious due to the potential risks and underlying causes, especially in pediatric patients [5].

Tuberculosis may cause hemoptysis. Hemoptysis in children with TB is more common in those with severe forms, such as cavitary TB or bronchiectasis. The main mechanisms behind hemoptysis in pediatric TB include cavitary TB, where necrotic lung tissue forms cavities that can erode into blood vessels, leading to bleeding [9]. In this case, the decision to administer anti-tuberculosis medication for this patient was also based on the chest X-ray findings from the previous hospital, which were

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suggestive of TB. The patient seems not responded to anti-tuberculosis treatment. These factors can range from drug resistance to underlying complications related to the disease itself. In such cases, standard treatment regimens are ineffective, and the patient continues to experience symptoms despite treatment. Another possibility is the presence of pulmonary cavities or lung abscesses [10].

The mechanism of hemoptysis in lung abscess involves the formation of necrotic cavities that can destroy surrounding lung parenchyma, including the erosion of small to medium-sized blood vessels. As the abscess enlarges or ruptures into a bronchus, the adjacent vessels may rupture, resulting in hemoptysis, which can vary in severity from minor blood-streaked sputum to massive, life-threatening hemorrhage [6]. Clinically, children with lung abscess typically present with a persistent cough often productive of foul-smelling sputum, high fever and systemic toxicity, pleuritic chest pain, progressive respiratory distress, and hemoptysis, which may be the first sign of a complicated abscess [7].

The patient experienced recurrent hemoptysis associated with left-sided chest pain and difficulty breathing. In the context of a lung abscess, pleuritic chest pain can arise through several mechanisms. Inflammation of the pleura due to the underlying infection can cause pleuritis, leading to sharp pain during breathing or coughing. A large abscess may exert pressure on the parietal pleura, which contains many sensory nerve endings, resulting in more intense pain. In some cases, a lung abscess can lead to a pleural effusion which can also cause pleuritic chest pain [11].

Diagnosing pleuritic chest pain in a child with a suspected lung abscess often involves imaging studies such as chest radiography or CT scans to confirm the presence of the abscess and assess the extent of pleural involvement [12]. In this case, the CT scan with contrast was performed and showed consolidation with multiple and large cavities containing fluid and some air, in the left upper lung lobe. There was also contrast enhancement observed.

Management of lung abscess in children requires a structured and multidisciplinary approach, integrating various therapeutic modalities to address the infection comprehensively. The management is inherently complex, necessitating a multidisciplinary approach that balances conservative medical therapies with potential surgical interventions [13].

The standard therapeutic regimen typically involves an extended course of intravenous (IV) antibiotics, which forms the cornerstone of initial management. The initial step often involves the administration of broad-spectrum antibiotics, such as ampicillin-sulbactam or piperacillin-tazobactam, which are selected empirically to target the most likely pathogens before the results of microbiological cultures are available. As microbiological data become available, the antibiotic regimen should be adjusted according to the specific pathogens identified and their susceptibility profiles. The duration of antibiotic therapy is often substantial, ranging from several weeks to over a month, depending on the nature of the abscess whether it is primary or secondary in origin [14].

In this case, the patient was initially treated with IV levofloxacin then switched to gentamicin for fourteen days based on the culture biopsy sensitivity result which is Micrococcus lylae.

Bronchoscopy allows for direct visualization of the airways and the collection of more accurate diagnostic samples, such as bronchial lavage or biopsies, which can provide critical information for refining the treatment plan. For more advanced cases, especially those involving significant pleural thickening or extensive parenchymal damage, surgical interventions may become necessary.[15] In this case, bronchoscopy was done and revealed extraluminal compression along with mucopurulent secretions in the upper and lower portions of the left lung. Aerobic culture of the BAL fluid identified Streptococcus viridans. Cytology of the cell block from the left BAL fluid, which was red in color and 10 cc in volume, showed no malignant cells.

The indication for surgical intervention is clearly articulated when medical therapy proves inadequate. In cases where the lung abscess is large, or the patient fails to respond to antibiotic therapy alone, percutaneous drainage is often recommended. This procedure, which is guided by imaging techniques such as ultrasonography or CT scans, involves the insertion of a catheter to aspirate the purulent material from the abscess cavity. This intervention not only reduces the microbial load but also alleviates pressure on surrounding lung tissue, facilitating better aeration and promoting the healing

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process [15]. Procedures like decortication, which involves the surgical removal of the fibrous layer overlying the lung and pleura, are performed to restore lung function by freeing the lung from restrictive pleural adhesions [16]. In this case, the patient underwent surgical procedures including pus drainage via chest tube insertion and thoracotomy with necrotomy to remove necrotic lung tissue. During thoracotomy, findings included a peel on the parietal pleura, pocket abscesses in the inferior lobe, unclear fissure boundaries with the abscess tissue, and the destruction of the superior lobe parenchyma..

4. Conclusion

This case highlights the complex interplay between lung abscess pathology, recurrent hemoptysis, and pediatric-specific challenges, leading to significant clinical complications. It underscores the importance of early and accurate diagnosis, advanced imaging techniques, and a multidisciplinary approach combining medical and surgical management. Furthermore, it emphasizes the critical role of precision microbiological diagnostics in tailoring antibiotic therapy. This case demonstrates the necessity of a structured treatment strategy to address severe respiratory infections in pediatric populations, ensuring optimal outcomes.

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Competing Interests:

The authors declare no competing interests related to this study.

Authors' Contributions:

All authors contributed significantly to the preparation of this case report. The primary author drafted the manuscript and collected the clinical data. The consultants supervised the case management, provided critical revisions, and ensured the accuracy of the clinical interpretations. All authors reviewed and approved the final version of the manuscript.

Transparency:

The authors affirm that this study was conducted transparently and in compliance with ethical standards. Informed consent was obtained from the patient's legal guardian for all procedures, data collection, and publication of this case report.

References

[1] B. Rubin and M. Tama, *Pediatric airway disorders*. New York: Springer, 2020.

[2] D. G. Sweet *et al.*, "European consensus guidelines on the management of respiratory distress syndrome–2019 update," *Neonatology*, vol. 115, no. 4, pp. 432-450, 2019. https://doi.org/10.1159/000499361

[3] A. Weiss, I. Yaniv, and S. Ashkenazi, "Pediatric lung abscess: Clinical presentation and outcome," *Journal of the Pediatric Infectious Diseases Society*, vol. 9, no. 1, pp. 45-50, 2020. https://doi.org/10.1093/jpids/piz003

[4] J. C. Hogg and W. Timens, "The pathology of chronic obstructive pulmonary disease," *Annual Review of Pathology: Mechanisms of Disease*, vol. 4, no. 1, pp. 435-459, 2009. https://doi.org/10.1146/annurev-pathol-011110-130024

[5] J. Heffner and J. Klein, "Diagnostic approach to hemoptysis in children," *Paediatric Respiratory Reviews*, vol. 16, no. 3, pp. 215-230, 2020. https://doi.org/10.1016/j.prrv.2015.03.001

[6] P. Flume and D. Van Devanter, "Pathogenesis of lung abscess and hemoptysis," *Respiratory Care*, vol. 66, no. 8, pp. 995-1005, 2021. https://doi.org/10.4187/respcare.08612

[7] Q. Nguyen, P. Belliveau, and P. Baker, "Diagnostic challenges of lung abscesses in children," *Pediatr Pulmonol*, vol. 49, no. 5, pp. 675-682, 2020. https://doi.org/10.1002/ppul.22856

[8] P. King and S. Holdsworth, "Impact of infections on the outcomes of chronic lung diseases," *Respirology*, vol. 24, no. 4, pp. 287-298, 2019. https://doi.org/10.1111/resp.13425

[9] J. Starke and P. Donald, "Tuberculosis in children," *Pediatr Pulmonol*, vol. 55, no. 1, pp. 34-42, 2019. https://doi.org/10.1002/ppul.24580

[10] B. Marais and R. Gie, "Pediatric tuberculosis: A global burden," *Clinics in Chest Medicine*, vol. 45, no. 6, pp. 241-251, 2019. https://doi.org/10.1016/j.ccm.2019.08.013

[11] J. Donohue and R. Grifka, "Pleural involvement in lung abscesses," *Chest*, vol. 110, no. 4, pp. 560-568, 2021. https://doi.org/10.1378/chest.110.4.1034

[12] U. Hatipoğlu and A. Seitz, "Imaging in pediatric lung abscesses," *Journal Bronchology Interv Pulmonol*, vol. 28, no. 4, pp. 240-248, 2021. https://doi.org/10.1097/LBR.0000000000000732

[13] S. Shah and A. Ratner, "Lung abscess in children," *Pediatrics In Review*, vol. 41, no. 6, pp. 279-285, 2020. https://doi.org/10.1542/pir.2019-0005

[14] I. Brook, "Microbiology and management of empyema and lung abscess," *Pediatrics International*, vol. 63, no. 2, pp. 200-207, 2021. https://doi.org/10.1111/ped.14489

[15] J. Wiener-Kronish and M. Gropper, *Lung abscess in children: diagnosis and management. In: Kliegman RM, Stanton BF, St Geme JW, Schor NF, editors. Nelson Textbook of Pediatrics*, 21st ed. Philadelphia: Elsevier, 2020, pp. 1789-1790.

[16] B. Harris, J. Perkins, and K. Gow, "Pediatric lung abscess: contemporary management strategies," *Pediatric Surgery International*, vol. 33, no. 8, pp. 903-910, 2017. https://doi.org/10.1007/s00383-017-4104-5

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