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Short Article

INFLUENCE OF PULMONARY SEQUESTRATION ON GROWTH AND BODY WEIGHT: CASE REPORT AND LITERATURE REVIEW

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ABSTRACT

Background: Pulmonary sequestration is a rare congenital anomaly involving non-functional lung tissue with systemic arterial blood supply. Its implications for pediatric growth and weight are poorly documented.

Case report: An 8-years-and-10-month-old previously healthy boy was diagnosed with pulmonary sequestration following pneumonia. Chest imaging revealed emphysematous changes, and computed tomography confirmed intralobar sequestration. Surgical removal was performed, revealing significant growth impairment with weight (18.9 kg) and height (117 cm), both below the 3rd percentile at admission, despite normal laboratory findings.

Discussion: Pulmonary sequestration can negatively influence pediatric growth due to chronic inflammation and hypoxia from recurrent infection. Surgical intervention typically results in clinical improvement and significant catch-up growth.

Conclusion: This case highlights pulmonary sequestration's potential negative impact on pediatric growth and underscores the importance of early surgical intervention for improving growth outcomes.

Keywords: pulmonary sequestration, pediatric growth, body weight, thoracotomy, congenital lung anomalies

INTRODUCTION

Pulmonary sequestration (PS) is a rare congenital lung anomaly in which a portion of non-functioning lung tissue lacks communication with the bronchial tree and receives its blood supply from an anomalous systemic artery (Savic et al., 1979). It is typically classified as either intralobar or extralobar, depending on its anatomical relationship with the pleura (Bratu et al., 2005). Although PS is often detected in infancy or early childhood, it can remain clinically silent until later stages of life (Sun & Xiao, 2012; Lee et al., 2008).

The reported incidence of PS among congenital pulmonary malformations varies from 0.15% to 6.4%, with intralobar types being more frequent (Wang et al., 2015). Intralobar sequestration lacks its own visceral pleura and is frequently associated with recurrent lower lobe pneumonias and chronic inflammation (Marcinow et al., 1998). Histopathologic studies suggest that these anomalies originate from abnormal budding of the primitive foregut during embryonic development, which may explain associated malformations (Riedlinger et al., 2011).

While the focus of most literature is on respiratory complications, emerging data suggest that PS may also contribute to impaired growth due to chronic inflammation and increased metabolic demand (Hardy et al., 2012; Wit et al., 2016). Accurate diagnosis, supported by multidetector computed tomography (MDCT), is crucial for identifying systemic arterial supply and planning resection (Lee et al., 2008). Surgical excision is typically curative, and early intervention may reverse systemic effects including growth failure.

CASE REPORT

An 8-years-and-10-month-old previously healthy boy presented with pneumonia in March 2023. Chest radiography showed bronchial infiltrates and a hyperinflated area (55x37mm), suggestive of emphysematous bullae. Subsequent computed tomography scan revealed cystic changes consistent with pulmonary sequestration. Right-sided thoracotomy with lower lobectomy was performed, identifying an aberrant systemic artery (diameter approx. 1 cm) originating from the mediastinum. Histopathology confirmed intralobar sequestration. At admission, the patient's weight (18.9 kg) and height (117 cm) were below the 3rd percentile, suggesting potential growth impairment (Figure 1 and 2). Laboratory results, including blood counts and biochemical markers, were within normal ranges, indicating no obvious systematic metabolic abnormalities.

DISCUSSION

Pulmonary sequestration (PS) is a rare congenital lung anomaly defined by non-functioning lung tissue that lacks communication with the bronchial tree and receives systemic arterial blood supply (Savic et al., 1979). It is traditionally categorized into intralobar and extralobar types, with the intralobar variant being more frequent and often diagnosed later due to milder or absent symptoms (Bratu et al., 2005).

Pulmonary sequestration represents a non-functioning lung segment with systemic arterial supply and no communication with the bronchial tree (Savic et al., 1979). Intralobar sequestration is more prevalent and often presents in older children or adolescents with recurrent infections or chronic cough (Bratu et al., 2005; Sun & Xiao, 2012).

Delayed recognition is not uncommon, especially in cases with mild or absent symptoms. Our patient was asymptomatic for nearly nine years before presenting with pneumonia. This delay mirrors findings from previous studies that emphasize the diagnostic challenges of intralobar types (Lee et al., 2008).

Imaging plays a vital role. Multidetector CT, especially with 3D vascular reconstruction, enables accurate identification of aberrant arteries and is essential for preoperative planning (Lee et al., 2008; Wang et al., 2015). Early and accurate diagnosis prevents complications and improves surgical outcomes.

In our patient, growth failure was a notable finding. Both height and weight were below the 3rd percentile at admission. Chronic respiratory disease is known to negatively impact linear growth through mechanisms such as inflammation-induced catabolism and elevated energy demands (Hardy et al., 2012; Wit et al., 2016). PS should be considered a potential contributor to poor growth, particularly when respiratory infections are recurrent (Gozal & Kheirandish-Gozal, 2006).

An aberrant artery of 1 cm in diameter was observed intraoperatively. While the clinical implications of vessel size in PS are not well defined, larger-caliber vessels may imply higher perfusion pressures and increased physiological stress (Gore et al., 2008). This might indirectly affect nutritional status and systemic oxygenation.

Surgical resection is the standard of care and is generally associated with excellent outcomes (Marcinow et al., 1998). In our case, lobectomy led to rapid catch-up growth and resolution of symptoms. This observation aligns with prior reports that emphasize the systemic benefits of timely surgery (Wang et al., 2015).

Minimally invasive approaches are increasingly adopted. Matsubara et al. (2023) demonstrated that the use of near-infrared thoracoscopy with intravenous indocyanine green (ICG) allows for precise localization of sequestered tissue, minimizing damage to adjacent structures. Corbett et al. (2022) further confirmed that VATS combined with ICG improves safety and visibility, particularly in pediatric cases.

Though PS is classically diagnosed in childhood, adult presentations do occur. Tong et al. (2023) reviewed multiple cases of adult PS misdiagnosed for years due to vague respiratory symptoms. Clinicians should maintain a high index of suspicion, especially in adults with recurrent localized pneumonias.

Rare complications such as gastro-pulmonary fistula have also been described. Molinari et al. (2023) reported such a case in a 20-year-old woman, highlighting the need for comprehensive evaluation and individualized

management strategies. Embryological insight from Riedlinger et al. (2011) also supports the theory that associated anomalies may stem from shared developmental pathways.

CONCLUSIONS

Early identification and surgical management of pulmonary sequestration positively influence growth outcomes in pediatric patients. In this case, both height and weight were significantly below the 3rd percentile at diagnosis. Notably, the aberrant artery supplying the sequestrated lung measured approximately 1 cm in diameter, raising the hypothesis that a larger vessel may contribute to systemic hemodynamic alterations affecting somatic growth. Although further studies are needed to confirm this association, the consideration of vascular characteristics may provide additional insight into the systemic impact of pulmonary sequestration.

DISCLOSURE

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: Joanna Rypel-Bośka. Methodology: Joanna Rypel-Bośka, Natalia Siuta. Investigation: Joanna Rypel-Bośka, Wiktoria Cecuła, Elżbieta Siuda. Data curation: Natalia Siuta, Aleksandra Gieras, Marcin Migiel. Writing – Original Draft: Joanna Rypel-Bośka, Izabela Brynczka. Writing – Review & Editing: Klaudia Goleniewska, Jakub Miaśnikiewicz. Supervision: Joanna Rypel-Bośka

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ETHICAL APPROVAL

The study was conducted in accordance with the Declaration of Helsinki. Ethical review and approval were waived because the data analyzed were retrospective and anonymized.

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Tables/Figures

Figure 1. Growth chart illustrating patient's weight percentile below the 3rd percentile at admission.

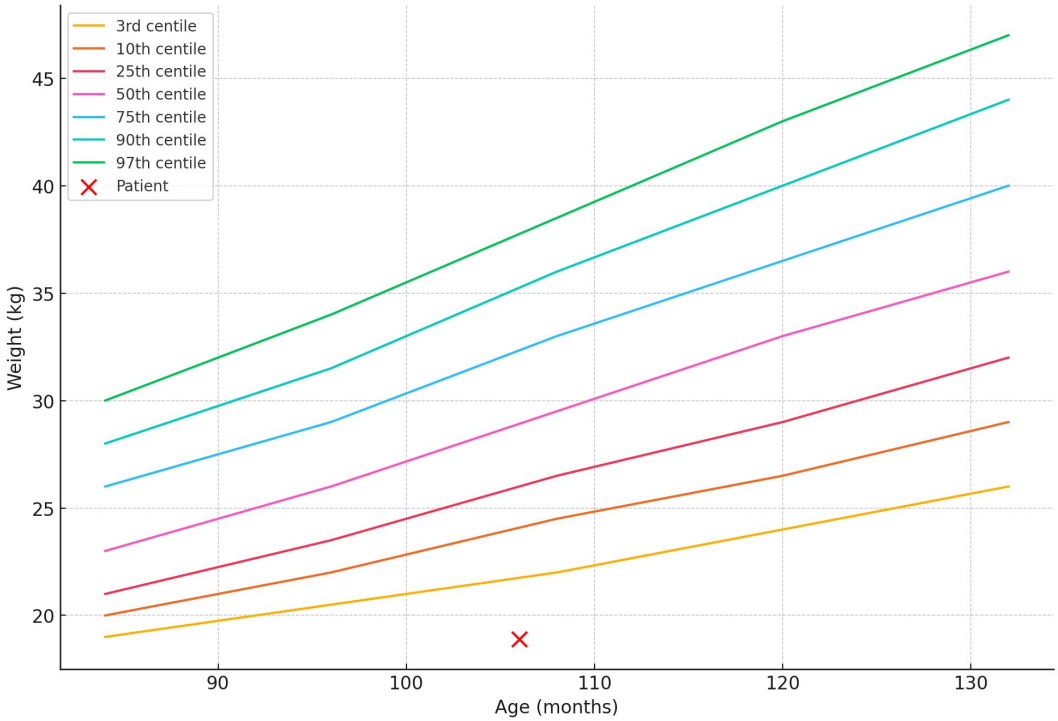

Figure 2. Growth chart illustrating patient's height percentile below the 3rd percentile at admission.