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# Pneumonia complicated by influenza type A in a pediatric patient: a case report

## Neumonía complicada por Influenza tipo A en paciente pediátrico: un reporte de caso

Bertha Fabiola Riera Chérrez [1], Ana Isabel Chávez Arévalo [2],* Diana Stefanía Alcivar Aveiga [3]

[1] Postgraduate in Pediatrics at the Roberto Gilbert Children's Hospital, Guayaquil Charity Board; mdfabiolariera@gmail.com, Guayaquil, Ecuador.

[2] Postgraduate in Pediatrics at Roberto Gilbert Children's Hospital, Guayaquil Charity Board; izachavez_19@hotmail.com, Guayaquil, Ecuador.

[3] Specialist in Pediatrics at Roberto Gilbert Children's Hospital, Guayaquil Charity Board; dalcivara@jbgye.org.ec, Guayaquil, Ecuador.

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### 1.1. Summary

Community-acquired pneumonia is a common cause of hospitalization in children and can be aggravated by viral infections such as influenza A. We present the case of a four-year-old female patient with no relevant medical history who was admitted with persistent fever, productive cough, and progressive respiratory distress. Imaging studies showed a collapsed left lung and loculated pleural effusion; influenza A was confirmed by nasopharyngeal swab. Due to the lack of clinical response to conventional medical treatment, a thoracotomy with left lower lobectomy was performed. The surgical finding revealed pulmonary necrosis and abundant fibrin. The postoperative course was favorable, with resolution of the respiratory symptoms and successful removal of the chest drain. This case highlights the importance of considering timely surgical intervention in pediatric patients with pneumonia complicated by influenza who do not respond to initial medical management.

**Keywords:** Pneumonia; Influenza type A; Pediatrics; Lobectomy; Pleural effusion.

### 1.2. Abstract

Community-acquired pneumonia is a common cause of hospitalization in children and can worsen due to viral infections such as influenza A. We report the case of a four-year-old female patient with no relevant medical history who presented with persistent fever , productive cough , and progressive respiratory distress . Imaging studies revealed left lung collapse and a loculated pleural effusion ; nasopharyngeal swab confirmed influenza A infection . Due to poor clinical response to medical treatment , a thoracotomy with left lower lobectomy was performed . Intraoperative findings revealed pulmonary necrosis and abundant fibrin . Postoperative recovery was favorable, with improvement of respiratory status and successful removal of the chest drain . This case highlights the importance of early surgical intervention in pediatric patients with complicated pneumonia due to influenza who fail to improve with conventional medical management .

**Keywords :** Pneumonia ; Influenza A; Pediatrics Lobectomy ; Pleural effusion.

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# 1. Introduction

Community-acquired pneumonia (CAP) remains one of the leading causes of hospitalization and mortality in children worldwide, accounting for approximately 15% of all deaths in children under five years of age, especially in low- and middle-income countries (1). This condition can be aggravated by viral infections, with influenza A virus being one of the main agents involved in severe respiratory conditions in children (2).

Influenza A causes an acute respiratory illness that can progress to complications such as necrotizing pneumonia, pleural effusion, lung abscess, and acute respiratory distress syndrome (ARDS) (3,4). Although most cases are self-limited, a subgroup of patients develops severe pneumonia, requiring prolonged hospitalization, advanced ventilatory support, and, in exceptional situations, thoracic surgery (5).

Current evidence describes that bacterial coinfection, dysregulated inflammatory response and destruction of the pulmonary parenchyma can lead to pulmonary necrosis, a situation that compromises the efficacy of conventional medical treatment (6). In these cases, lobectomy can be a safe and effective therapeutic alternative, especially when there is a poor clinical response or the presence of pneumatoceles and abscesses (7). Recent studies highlight that severe respiratory infections due to influenza have increased their incidence in post-pandemic contexts , and that their management requires a multidisciplinary approach to improve patient prognosis(8).

In Latin America, case reports documenting the clinical course of pediatric patients with pneumonia complicated by *influenza A* are scarce, and those describing surgical interventions such as lobectomy are even more limited. This underscores the importance of presenting clinical experiences that can enhance therapeutic approaches in similar contexts. (9).

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In this context, this article aims to describe the clinical case of a four-year-old pediatric patient with community-acquired pneumonia complicated by influenza A, which progressed to pulmonary necrosis and required a left lower lobectomy. This article aims to contribute to the available clinical evidence and highlight the importance of early diagnosis and timely intervention in these cases.

## 2. Clinical case

A 4-year-old female pediatric patient with a complete vaccination schedule presented to the pediatric emergency department with persistent fever of 13 days' duration. The initial symptom was unspecified fever associated with a dry cough that progressed to a productive cough, mild headache, and episodes of diarrhea two to four times a day, with no mucus or blood present. Two to three episodes of vomiting were also reported in a 24-hour period. In the 72 hours prior to admission, the patient experienced increasing respiratory distress, prompting the mother to seek hospital consultation.

On admission, vital signs showed: temperature of 39.5°C, respiratory rate of 52 rpm, heart rate of 170 bpm , oxygen saturation of 98% with evident respiratory distress. A Woods Downes score of 6 was obtained. Physical examination revealed semi-moist mucous membranes, subcostal to supraclavicular retractions, and decreased breath sounds with the presence of transmitted rhonchi. Immediate management was initiated with oxygen through corrugated hose, peripheral cannulation, and intravenous paracetamol administration at 15 mg/kg/dose as required.

Initial laboratory tests included a chest x-ray that revealed complete opacity of the left lung field with right mediastinal shift. Thoracic ultrasound showed a loculated left pleural effusion with an estimated volume of 181 cc. Chest computed tomography (CT) confirmed left lung collapse with pneumatoceles, pleural effusion, and signs of bilateral

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interstitial infiltrate. Laboratory studies showed leukocytosis (28,790/mm³), neutrophilia, elevated C-reactive protein (CRP), and a positive detection of *influenza A virus* by nasopharyngeal swab. Tuberculosis was ruled out by PPD, pleural fluid cultures, and gastric aspirate.

The patient was diagnosed with pneumonia complicated by *influenza type A*, associated with loculated pleural effusion and collapsed left lung. Treatment was initiated with high-flow oxygen therapy, initially at 15 L/min with an FiO2 of 50%, progressively adjusted according to saturation. Ceftriaxone was administered at 100 mg/kg/day divided into two doses and clindamycin at 30 mg/kg/day every 8 hours intravenously. Antipyretic support was maintained with paracetamol every 6 to 8 hours if the temperature was greater than 38.5 °C. Additionally, moderate fluid restriction, strict monitoring of urine output, and electrolyte control were indicated.

Due to the persistence of fever, the deterioration of respiratory status and the imaging findings compatible with left lung collapse, loculated pleural effusion and presence of pneumatocele, surgical intervention was decided on the third day of hospitalization. Left thoracotomy with resection of the lower lobe (lobectomy) and placement of a chest tube for drainage, during the procedure extensive pulmonary necrosis and abundant fibrin were observed.

The patient was transferred to the Pediatric Intensive Care Unit (PICU) for close postoperative monitoring, where she received a red blood cell transfusion for postoperative anemia and high-flow oxygen therapy. The intravenous antibiotic regimen was continued for a total of 21 days. Postoperative management included monitoring of vital signs, pleural drainage monitoring, multimodal analgesia with dipyrone and paracetamol, fluid balance monitoring, periodic evaluation with imaging and laboratory studies, and pain control with intercostal block in the operating room. During her stay, she showed progressive improvement in

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respiratory and inflammatory parameters, allowing for the removal of the drainage tube on the fifth postoperative day.

Her evolution during the 21 days of hospitalization was favorable. Before discharge, the patient was hemodynamically stable, neurologically alert, with preserved mobility, oriented, with no signs of respiratory distress. The right lung field was well ventilated and the left was slightly hypoventilated. The chest tube wound was healing, and she performed Triflow (incentive spirometer) breathing exercises every 4 hours, with good oral tolerance and no abdominal warning signs. Control laboratory tests showed leukocytes: 6.78 x$10^3$/$mm^3$, neutrophils: 41%, lymphocytes: 39%, hemoglobin: 11.7 g/ dL , hematocrit: 33.8%, platelets: 447 x$10^3$/$mm^3$ and CRP: 3.69 mg/L. The biopsy revealed a fibrin -leukocyte exudate with no stroma, granulomas, or pathogens. The follow-up echocardiogram was normal, with no pericardial effusion. The patient did not experience any further fever spikes and maintained good respiratory progress. She was discharged from the hospital with follow-up care by specialists and outpatient pediatricians, pulmonology, infectious disease, and pediatric surgery. She was also instructed to perform home breathing exercises and antireflux treatment. The mother was instructed regarding warning signs and home care.

### 2.1. Figures, Tables and Diagrams

**Table 1.**
**Auxiliary examinations performed on the patient**

| *LABORATORY TESTS* | *ADMISSION RESULT* | *REFERENCE VALUE* |
|---|---|---|
| LEUKOCYTES (/UL) | 22,800/ uL | 4,000 - 10,000/ uL |
| NEUTROPHILS (%) | 76.1% | 40 - 75% |
| LYMPHOCYTES (%) | 12.3% | 20 - 45% |

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| | | |
|---|---|---|
| HEMOGLOBIN (G/DL) | 8.4 G/DL | 11.5 - 15.5 G/DL |
| HEMATOCRIT (%) | 24.2% | 34 - 44% |
| PLATELETS (/MM³) | 750,000 MM³ | 150,000 - 450,000 MM³ |
| C-REACTIVE PROTEIN - CRP (MG/DL) | 268 MG/DL | < 5 MG/DL |
| PROCALCITONIN - PCT (MG/DL) | 1.13 MG/DL | < 0.5 MG/DL |
| BLOOD CULTURE CULTURE | No growth | - |
| URINE CULTURE | No growth | - |
| TUBERCULOSIS (PPD, PCR, CULTURE) | Non-reactive | - |
| INFLUENZA TYPE A SWAB | Positive | - |
| RSV / COVID-19 SWAB | Negative | - |
| ECHOCARDIOGRAM | - | - |
| CATHETER CULTURE | No growth | - |
| CATHETER GRAM | No growth | - |
| BIOPSY | - | - |
| ***Laboratory Test Control*** | ***Result*** | ***Reference Value*** |
| Leukocytes (/ uL ) | 6,780 | 4,000 - 10,000 / uL |
| Neutrophils (%) | 41% | 40 - 75% |
| Lymphocytes (%) | 39% | 20 - 45% |
| Hemoglobin (g/ dL ) | 11.7 g/ dL | 11.5 - 15.5 g/ dL |
| Hematocrit (%) | 33.8% | 34 - 44% |
| Platelets (/mm³) | 447,000 mm³ | 150,000 - 450,000 /mm³ |
| C-reactive protein (CRP, mg/ dL ) | 3.69 MG/DL | < 5 mg/ dL MG/DL |
| Echocardiogram | Normal | Without pericardial effusion |
| Biopsy | fibrin exudate , without granulomas or pathogenic microorganisms | - |

Source: prepared by the author (2024)

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**Figure 1.** Posteroanterior (PA) chest radiograph showing a homogeneous consolidation in the left hemithorax, with rightward displacement of the trachea and mediastinum. Blurring of the left costodiaphragmatic angle, cardiac area within normal limits, and free right costophrenic sinuses are observed. These findings are consistent with moderate to severe left pleural effusion.

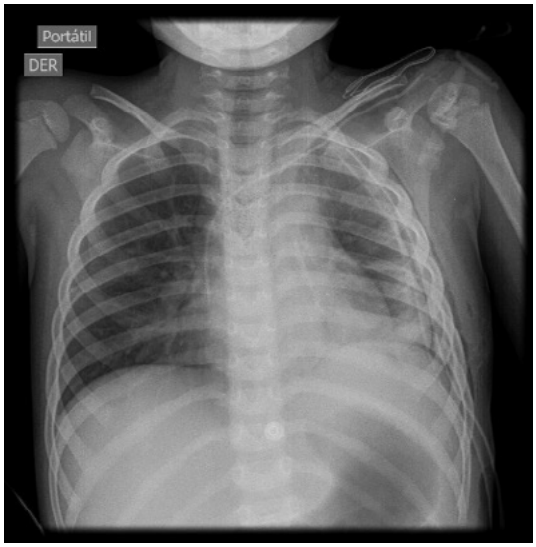


**Figure 2.** Pleural ultrasound revealed a moderate-volume left pleural effusion, estimated at 181 cc, with multiple partitions and septa within the pleural cavity. No debris or free fluid was observed in the right pleural cavity. These findings were consistent with a left loculated pleural effusion.

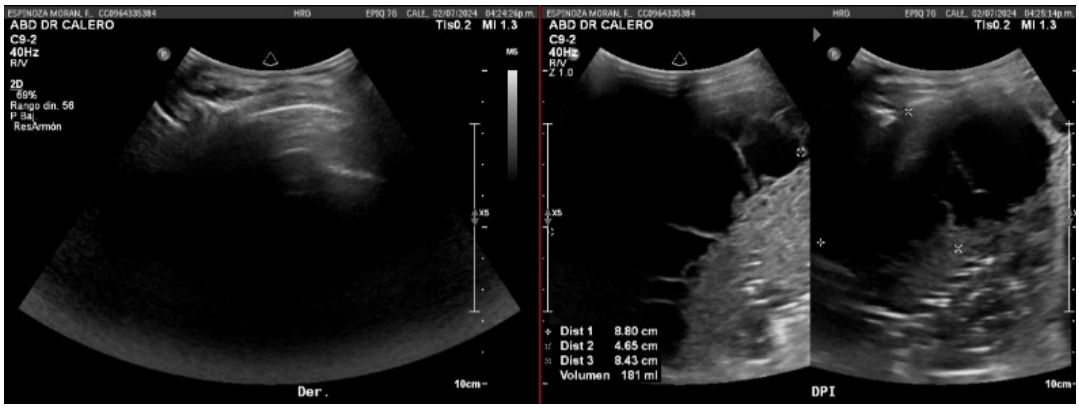

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**Figure 3A.** Coronal reconstruction of the chest computed tomography (CT) (Figure 3A) . Collapse of the left lower lobe is confirmed, with shift of the mediastinum and trachea to the right. Bilateral interstitial and reticular infiltrates are identified, predominantly on the left side. No anomalous lymph nodes or cavitations are observed. Axial section of the chest computed tomography (CT) (Figure 3B). Collapse of the left lower lobe is evident, with dense consolidation and loss of lung volume. Pneumatoceles and areas of necrosis are observed in the affected parenchyma. The moderate-volume left pleural effusion displaces the adjacent lung parenchyma. The right lung field shows interstitial infiltrates without evidence of pleural effusion.

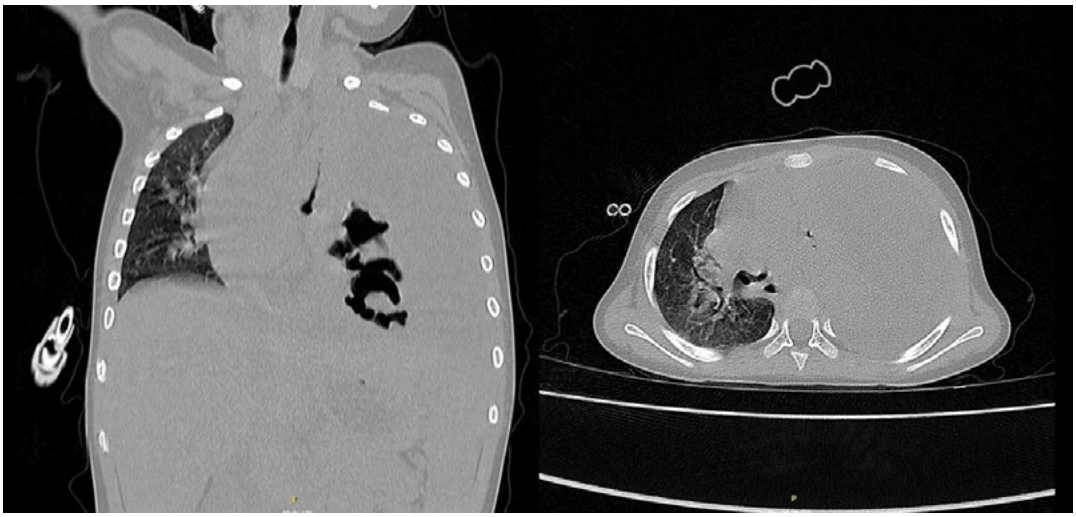

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**Figure 4.** Portable chest radiograph in anteroposterior (AP) projection shows a cardiac area within normal limits, free costophrenic sinuses, and adequate height of both hemidiaphragms. Accentuation of the pulmonary interstitium is observed with the presence of bilateral perihilar infiltrates , with no evidence of pleural effusion or mediastinal shift. A correctly positioned left pleural drainage tube is identified.

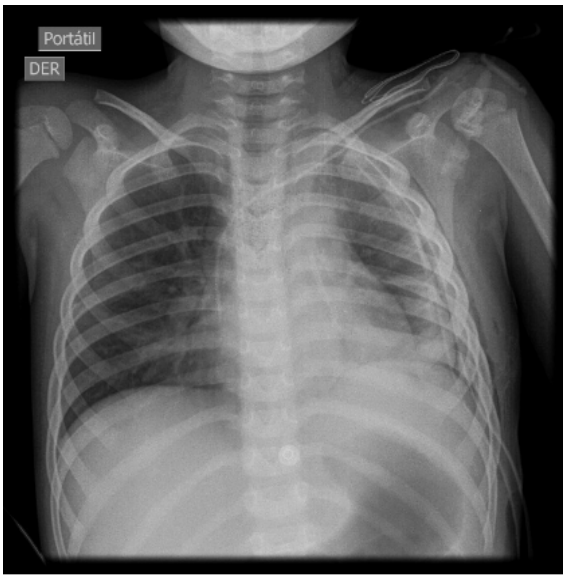
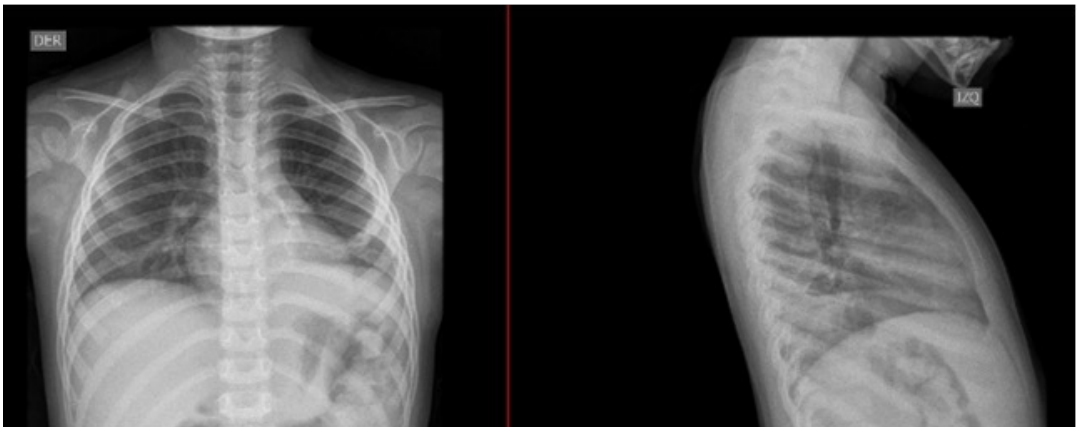



**Figure 5.** Pre-discharge posteroanterior (AP) (Figure 5A) and lateral chest radiographs (Figure 5B) showing an image of consolidation in the left hemithorax, with dense alveolar infiltrate, effacement of the costodiaphragmatic and left angle, and elevation of the ipsilateral hemidiaphragm.



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## 3. Discussion

Community-acquired pneumonia remains a leading cause of hospitalization and childhood morbidity and mortality, with potentially serious complications such as pleural effusion, pulmonary necrosis, and pneumatocele formation (1). *Influenza type A* infection , recognized for its high dissemination capacity and respiratory tract involvement, is associated with an increased risk of bacterial superinfection and progression to severe conditions (10).

In the case presented, the patient developed pneumonia complicated by loculated pleural effusion and pulmonary necrosis, which required medical and surgical management. These manifestations are consistent with those described in recent studies, where coinfection with *influenza A* and bacterial agents such as *Staphylococcus aureus* (*Staphylococcus aureus*) *is suspected*. *aureus* or *Streptococcus pneumoniae* increases the severity of the clinical picture (11). The persistence of fever, lack of response to empirical antibiotic therapy and radiological findings of lung collapse and pneumatoceles justified the indication for lobectomy, following recommendations in the literature for refractory cases (12).

Although most complicated pneumonias in pediatrics resolve with medical treatment, a subgroup requires surgical intervention. A multicenter study reported that up to 5% of pediatric patients with necrotizing pneumonia progress to procedures such as lobectomy, especially in the presence of persistent sepsis, extensive lung destruction, or organizing empyema (13). The decision for surgical intervention in this case was based on radiological progression and clinical deterioration, which is consistent with these recommendations.

However, diagnostic limitations include the lack of specific microbiological isolation in pleural fluid, a common occurrence in patients who have previously received antibiotic therapy. Furthermore, delayed surgical indication is a factor associated with increased morbidity,

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highlighting the need for institutional protocols to guide timely decision-making (14).

From a therapeutic point of view, the combination of high-flow oxygen therapy, broad-spectrum antibiotic therapy and surgical management allowed a favorable recovery in this patient, agreeing with current evidence that highlights the importance of a multidisciplinary approach (15). Therapeutic alternatives such as video-assisted thoracoscopy (VATS) are considered in some centers, however, the choice of open thoracotomy remains valid in contexts where the disease is extensive and specialized equipment is limited (16).

This case highlights the need to consider early surgical intervention in pneumonia complicated by *influenza A* with poor clinical outcome, as well as the importance of a comprehensive approach to reducing complications and improving the prognosis in pediatric patients.

## 4. Conclusions

Pneumonia complicated by influenza type A in the pediatric population represents a diagnostic and therapeutic challenge, especially in cases that progress to severe forms such as pulmonary necrosis. This clinical case illustrates the importance of a comprehensive approach, in which early identification of complications and the timely decision to intervene surgically can be decisive in reducing morbidity and improving prognosis.

The combination of intensive medical treatment, advanced ventilatory support, and surgical management led to a favorable outcome for the patient, reaffirming the usefulness of lobectomy as a therapeutic option in cases refractory to conventional treatment. Evidence shows that clinical and radiological outcomes must be carefully monitored to avoid delays in decision-making.

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This report emphasizes the need to develop specific management guidelines for influenza-associated necrotizing pneumonia in pediatrics, tailored to the resources available at each institution. It also highlights the importance of conducting more multicenter studies analyzing predictors of poor outcomes to optimize interventions for these patients.

The dissemination of clinical experiences such as the one described here contributes to enriching knowledge about the management of complicated pneumonias and highlights the importance of multidisciplinary work in addressing these highly complex pathologies.

## 5. Abbreviations

**NAC:** Community-acquired pneumonia
**ARDS:** Acute Respiratory Distress Syndrome
**UCIP:** Pediatric Intensive Care Unit
**CT:** Computed Axial Tomography
**PCR:** C-Reactive Protein
**RSV:** Respiratory Syncytial Virus
**PPD:** Purified Protein Derivative (Tuberculin Test)
**FiO2:** Fraction of Inspired Oxygen
**VATS:** Video-Assisted Thoracoscopic Surgery (Video-assisted Thoracoscopy )
**MRSA:** Methicillin-Resistant Staphylococcus aureus (Staphylococcus methicillin -resistant aureus)

## 6. Contribution of the authors

First author initials: Data collection, case description, literature and analysis.

Second author initials: Systematic review and case discussion

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Third author initials: Final case review and updated literature contribution.

## 7. Ethics committee approval and consent to participate in the study

For the publication of this clinical case, all ethical standards established by the institution and the principles of the Declaration of Helsinki were adhered to. Informed consent for publication of the case was granted by the legal representative, who was duly informed about the nature, objectives, and scope of the presentation. The confidentiality and anonymity of the minor are guaranteed. A copy of the corresponding informed consent is attached.

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