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Rupture of an Intercostal Artery Pseudoaneurysm
in a 14-Year-Old Boy: A Case Report

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Patient: **Male, 14-year-old**
Final Diagnosis: **Hemothorax • intercostal artery pseudoaneurysms**
Symptoms: **Thoracic and back pain • chest tightness • cough • fever**
Clinical Procedure: —
Specialty: **Pulmonology****Objective:** **Challenging differential diagnosis****Background:** Intercostal artery pseudoaneurysm is a rare yet clinically important vascular cause of hemothorax that can be overlooked when initial manifestations mimic infectious pulmonary disease.**Case Report:** A 14-year-old boy presented with a 1-week history of fever, cough, and progressive right-sided chest and back pain. Initial computed tomography (CT) showed inflammatory opacities in the right lower lobe accompanied by pleural thickening, yielding a presumptive diagnosis of pneumonia. Antibiotic therapy alleviated fever and cough; however, the pain intensified and the right pleural effusion expanded. Ultrasound-guided thoracic drainage yielded hemorrhagic fluid, prompting further workup to identify a vascular bleeding source. Contrast-enhanced CT and CT angiography identified a pseudoaneurysm originating from the right ninth intercostal artery, and selective catheter angiography confirmed active extravasation from the lesion. Transcatheter arterial embolization successfully achieved hemostasis. Pleural-fluid bacterial and fungal cultures returned negative; however, an infectious etiology and underlying vascular disorders could not be completely excluded. As no traumatic or iatrogenic precipitating factor was identified, the lesion was categorized as non-traumatic and non-iatrogenic with undetermined etiology. At 1-month follow-up, the patient remained asymptomatic, and CT demonstrated ongoing resolution of the hemothorax.**Conclusions:** This case report shows that vascular etiologies of hemothorax, despite their low prevalence, must be included in the differential diagnosis for patients displaying an atypical clinical trajectory, especially when hemorrhagic pleural effusion develops following an initial clinical picture mimicking pulmonary infection. Timely implementation of contrast-enhanced CT, angiography, and endovascular embolization is pivotal to achieving definitive diagnosis and optimal therapeutic outcomes.**Keywords:** **Embolization, Therapeutic • Hemothorax**Full-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/954555>

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Introduction

Hemothorax stems from diverse etiologies. Trauma and iatrogenic injury are the predominant causes, while spontaneous vascular etiologies remain uncommon [1]. Intercostal artery pseudoaneurysm is a rare yet clinically important vascular cause of hemothorax. Its documented secondary triggers consist of penetrating or blunt thoracic trauma [2-4] as well as thoracic or percutaneous procedures [5-10], and non-traumatic cases are uncommon [11-14]. Owing to its low incidence and nonspecific presentations, diagnosis is prone to delay, especially when initial manifestations mimic common pulmonary infections. Most previously reported cases involved adults, while our patient was only 14 years old. Such presentation in an adolescent is a distinctive feature of the present case. Given the absence of chest trauma, thoracic surgery, or invasive thoracic procedures prior to symptom onset, the lesion was classified as non-traumatic and non-iatrogenic; nevertheless, its underlying etiology remained undetermined. This report emphasizes the importance of considering a vascular source in patients with presumed infectious pleural disease who exhibit an atypical clinical course. It also highlights the diagnostic utility of contrast-enhanced CT and angiography. In addition, we discuss potential etiologies and the limitations of etiological assessment in this young patient.

Case Report

A 14-year-old boy presented with a 1-week history of thoracic and back pain. His initial manifestations were fever and cough, a peak body temperature of 38°C, and intermittent chest tightness. Chest computed tomography (CT) demonstrated inflammatory opacities in the right lower lobe and patchy pleural thickening (**Figure 1A**). Following antibacterial therapy, the fever and cough subsided, but the pain progressively worsened. Repeat CT revealed progression of pleural thickening accompanied by new right pleural effusion (**Figure 1B**).

The patient recalled a prior similar episode of right-sided chest and back pain 1 year earlier, which resolved spontaneously. No clinical assessment or imaging examination was performed at that time; therefore, no direct association between the previous episode and the current vascular lesion could be established. Upon admission, he was afebrile and hemodynamically stable. Physical examination revealed mild pallor, dullness to percussion over the right lower lung field, and diminished breath sounds. Laboratory testing showed anemia, elevated inflammatory markers, and a markedly elevated D-dimer level. Mild elevations in cytokeratin 19 fragment and neuron-specific enolase were considered nonspecific and of uncertain clinical significance because pleural-fluid cytology revealed no abnormal cells. The D-dimer elevation may have been related to active bleeding and inflammation but was not considered evidence of a specific thrombotic process. In view of the progressive pleural effusion, ultrasound-guided thoracic drainage was performed and yielded an initial 500 mL of hemorrhagic pleural fluid. The hemorrhagic nature of the effusion prompted further evaluation for causes other than uncomplicated pneumonia or parapneumonic effusion.

The differential diagnosis included infection, malignancy, traumatic or iatrogenic bleeding, and a vascular source of bleeding. Pleural fluid bacterial cultures, assays for tuberculosis and fungal pathogens, and cytological results were negative. Sputum analysis results showed mixed bacterial organisms; however, the patient had no persistent fever, whereas inflammatory markers remained elevated during the early phase of hospitalization. There was no history of chest trauma or prior thoracic intervention. No dedicated evaluation of systemic vascular or connective tissue disease was performed.

These findings prompted further investigation to identify a vascular source of bleeding. Contrast-enhanced chest CT demonstrated a large right pleural effusion with areas of increased density and multiple tortuous, dilated vessels. A nodular vascular lesion

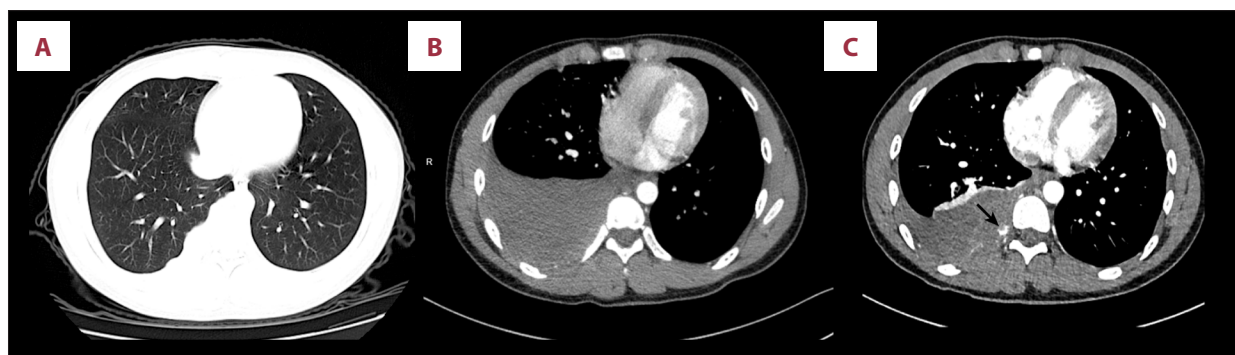


Figure 1. (A) Initial chest CT demonstrates inflammatory changes in the right lower lobe with irregular pleural thickening; (B) Follow-up CT revealed more pronounced pleural thickening accompanied by a right-sided pleural effusion; (C) Contrast-enhanced CT demonstrates tortuous and dilated vessels and a nodular enhancing vascular lesion at the right T9 vertebral level (arrow), accompanied by right hemothorax.



Figure 2. Sagittal oblique reconstruction demonstrates a pseudoaneurysm arising from the right ninth posterior intercostal artery (arrow).

was identified adjacent to the right T9 vertebral body (**Figure 1C**). Subsequent CT angiography with vascular reconstruction confirmed the presence of a pseudoaneurysm arising from the right ninth intercostal artery (**Figure 2**). Under local anesthesia, transcatheter angiography and embolization were performed. Selective angiography of the right ninth intercostal artery demonstrated abnormal vascular branching and contrast extravasation, confirming rupture of the pseudoaneurysm. Superselective catheterization was then performed to delineate the vascular anatomy, avoid potential spinal arterial branches, and reduce

the risk of spinal cord ischemia. Three MWCE-18S-2.0-2-HILAL coils were used to occlude the proximal and distal segments of the affected right ninth intercostal artery (**Figure 3**). Abnormal branches of the right tenth intercostal artery and a right bronchial arterial branch were embolized using 300 to 500 μ m microspheres and gelatin sponge particles. The microspheres and gelatin sponge particles were each mixed with 30 mL of contrast medium before administration, and the microsphere suspension was remixed before each injection. The fluoroscopy time and total procedural contrast volume were not available in the retrospective records. Post-embolization angiography showed complete obliteration of the abnormal vessels while preserving the main arterial trunk, and the procedure was completed without complications. The diagnosis was based on the characteristic CTA and catheter angiographic findings. Histopathological confirmation was not obtained because the lesion was treated endovascularly. After treatment, the patient's condition improved significantly. After full drainage, the chest tube was removed. Follow-up chest CT demonstrated a metallic hyperdense focus with associated radial streak artifacts adjacent to the right side of the T9 vertebral body. Surrounding patchy areas of increased attenuation were noted, with mildly elevated local density, findings that are suggestive of residual blood clot formation (**Figure 4A**). At the 1-month outpatient follow-up, repeat CT demonstrated further clot resolution (**Figure 4B**), and the patient remained clinically stable without recurrent chest or back pain. Because longer-term imaging was not yet available, continued clinical and imaging surveillance was planned, including contrast-enhanced CT or CT angiography to assess for recurrent filling of the pseudoaneurysm or collateral vessels. A consolidated timeline of the clinical course, diagnostic investigations, treatment, and follow-up is provided in **Table 1**.

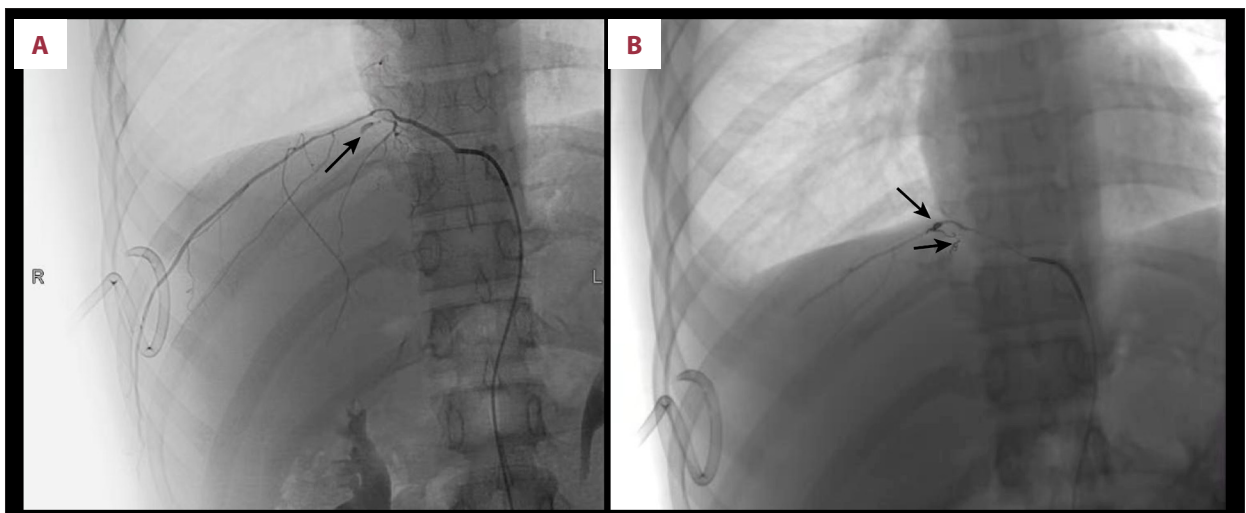


Figure 3. Selective catheter angiography before and after embolization. (**A**) Pre-embolization angiography of the right ninth intercostal artery demonstrates rupture of the pseudoaneurysm with contrast extravasation (arrow). (**B**) Completion angiography after coil embolization demonstrates occlusion of the proximal inflow and distal outflow segments of the pseudoaneurysm (arrows), with no residual contrast extravasation.

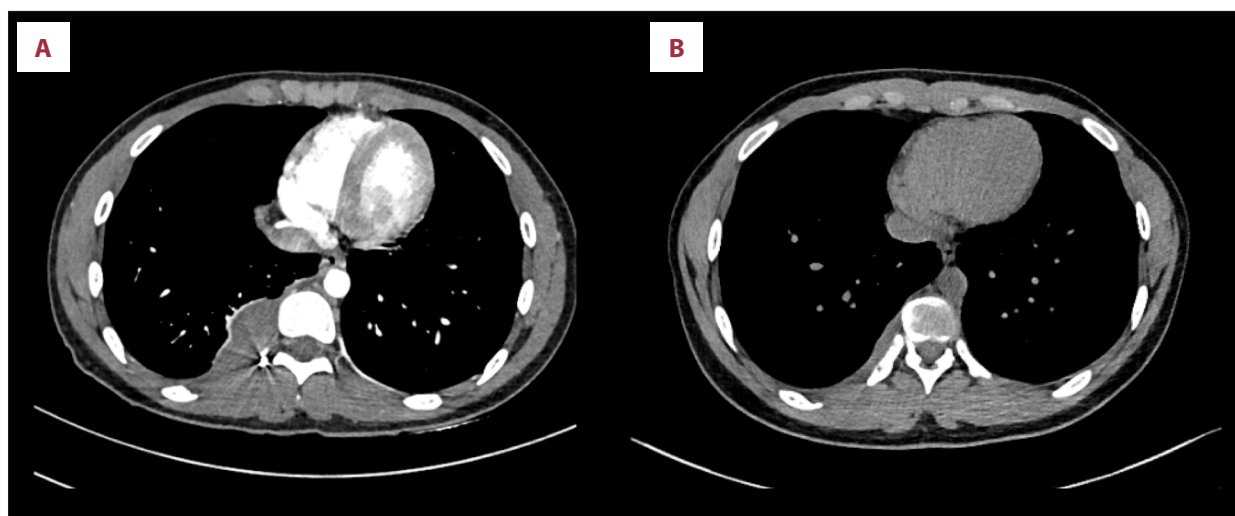


Figure 4. (A) Post-embolization follow-up CT demonstrated a small right-sided pleural effusion and a high-attenuation focus adjacent to the T9 vertebral body; (B) CT performed 1 month after embolization indicated further dissolution of the thrombotic mass.

Table 1. Timeline of the clinical course, diagnostic evaluation, treatment, and follow-up.

Date/interval	Clinical course and findings	Investigation, management, and outcome
Approximately 1 week before admission	Right lower chest and back pain developed without an obvious trigger, accompanied by fever up to 38 °C, cough with sputum, and occasional chest tightness	The patient was evaluated at an outside facility, where chest CT was performed, although the images were unavailable for review. Anti-infective treatment was recommended
6 days before admission	Severe right-sided chest and back pain recurred during the night	The patient received anti-infective treatment and subsequently underwent emergency evaluation. Chest CT demonstrated right lower-lobe inflammatory changes, irregular right pleural thickening, right rib abnormalities, and bilateral pulmonary micronodules. Cephalosporin therapy was administered, but the pain did not improve substantially
3 days before admission	Persistent pain with radiological progression and development of right pleural effusion	Repeat chest CT with contrast showed increased right pulmonary inflammatory changes, progressive pleural thickening, and right pleural effusion. Ultrasound-guided chest drainage yielded an initial 500 mL of hemorrhagic fluid, followed by intermittent drainage
During the 3 days before admission	Chest and back pain and hemorrhagic pleural drainage persisted without marked clinical improvement	The patient continued to receive anti-infective treatment and was subsequently referred for further evaluation
Day of admission	Admitted because of persistent chest and back pain and hemorrhagic pleural effusion. The patient was afebrile and hemodynamically stable	Laboratory testing showed anemia, elevated inflammatory markers, and markedly elevated D-dimer
1 day after admission	Severe recurrent chest and back pain despite previous treatment	Contrast-enhanced CT demonstrated hemothorax and an abnormal vascular lesion arising from the right ninth intercostal artery, raising suspicion of a pseudoaneurysm with bleeding
Day of embolization (2 days after admission)	Vascular source of bleeding confirmed	Selective catheter angiography confirmed a right ninth intercostal artery pseudoaneurysm. Transcatheter arterial embolization was performed using coils, microspheres, and gelatin sponge particles

Table 1. Timeline of the clinical course, diagnostic evaluation, treatment, and follow-up.

Date/interval	Clinical course and findings	Investigation, management, and outcome
Days 1 to 6 after embolization	Chest and back pain progressively improved, and pleural drainage decreased	Follow-up ultrasonography and CT showed progressive reduction of the right pleural effusion/hemothorax
10 days after embolization	Clinically stable without recurrent pain or fever	The chest tube was removed, and the patient was discharged
1 month after embolization	The patient remained clinically stable	Follow-up CT demonstrated further resolution of the residual blood clot

Table 2. Reported non-traumatic intercostal artery pseudoaneurysm cases and the present case.

Study/ source	Sex/ age (y)	Symptoms	Cause	Diagnostic method	Treatment	Outcome
Liu et al [11]	Male/60	Acute chest pain, hemothorax	Reported as spontaneous	CTA	Covered stent	Recovered without recurrence at 1 month
Junck et al [12]	Male/63	Acute back pain, hematoma	Reported as spontaneous	CTA/DSA	Embolization	Recovered without further complications
Li et al [13]	Male/43	Acute upper abdominal pain, hemothorax	Reported as spontaneous	CTA	None	Died before intervention
Agarwal et al [14]	Female/47	Acute back pain	No major thoracic trauma or iatrogenic procedure; possible osteophyte-related mechanical injury during forceful lifting and twisting	CT/CTA; DSA	Conservative management	Spontaneous resolution; asymptomatic on follow-up
Our case	Male/14	Chest pain, hemothorax	Non-traumatic and non-iatrogenic; etiology undetermined	CT/CTA; DSA	Embolization	Clinical improvement; no recurrence at 1 month

Note: Reference numbers correspond to those in the main manuscript. Abbreviations: CT, computed tomography; CTA, computed tomography angiography; DSA, digital subtraction angiography.

Discussion

Intercostal artery pseudoaneurysms can present with acute chest or back pain [11,12,14], upper abdominal pain [13], hemothorax [4,5,8,9,11,13], or other nonspecific symptoms. Although our patient initially presented with infectious symptoms such as fever and cough, these resolved rapidly after anti-infective therapy. However, his chest pain progressively worsened, which could not be explained by pneumonia or the associated parapneumonic effusion. This discordance between apparent infectious improvement and ongoing deterioration was the key diagnostic challenge in this case. Therefore, if the patient's condition worsens, the patient does not respond to antibiotic

treatment, or develops rapidly increasing pleural effusion, non-infectious causes should be considered. In our case, enhanced CT shifted the diagnostic impression from simple pneumonia with parapneumonic effusion to a vascular lesion. Subsequent angiography with vascular reconstruction precisely identified the intercostal artery pseudoaneurysm as the bleeding source. Notably, intraoperative angiography helped identify additional abnormal vessels and allowed timely embolization, thereby improving the completeness of treatment.

Reported secondary causes include penetrating or blunt chest trauma [2-4] and thoracic or percutaneous interventions [5-10]]. No traumatic or iatrogenic trigger was identified in this

case. Although infectious arteritis can cause arterial wall destruction and pseudoaneurysm formation [15], an infectious etiology could not be excluded because blood cultures and histopathological examination were unavailable. As no dedicated evaluation for an underlying connective-tissue disorder or systemic vasculopathy was performed, the lesion was classified as non-traumatic and non-iatrogenic, with an undetermined etiology. The significance of the previous self-limited episode remains uncertain.

Embolization is generally considered the preferred treatment for pseudoaneurysm rupture [5,4,12]. Other treatment options include covered stent placement [11], ultrasound-guided thrombin injection [6,10], conservative management [14], and open surgical resection [7]. Because lower thoracic intercostal arteries can contribute to spinal cord perfusion, their relationship with radiculomedullary arteries, particularly the artery of Adamkiewicz, should be carefully assessed before embolization [14,16,17]. This anatomical consideration informed the embolization strategy in our patient. In the present case, selective coil embolization combined with adjunctive embolic materials achieved immediate hemostasis and rapid clinical stabilization, consistent with established endovascular management strategies. This supports the effectiveness of minimally invasive intervention in the treatment of this rare vascular entity.

Previously reported cases classified by the original authors as spontaneous or lacking a documented traumatic or iatrogenic trigger, and with sufficient patient-level information, are summarized in **Table 2** [11-14]. All comparative patients from prior reports were adults aged 43 to 63 years, whereas our patient was only 14 years old, which broadens the known age spectrum of non-traumatic and non-iatrogenic intercostal artery pseudoaneurysm and is the major distinctive feature of the present report. This case report also highlights a practical diagnostic consideration: when presumed infectious pleural disease demonstrates atypical progression—particularly disproportionate or worsening pain accompanied by rapidly accumulating pleural effusion—vascular etiologies should be actively considered. In such scenarios, early contrast-enhanced CT followed by angiographic confirmation is essential to avoid diagnostic delay and ensure appropriate management.

Limitations

This report has several limitations. Blood cultures and histopathological examination of the vascular lesion were not obtained, and no dedicated serological evaluation for vasculitis or autoimmune rheumatic disease, genetic testing, or systematic screening for additional vascular abnormalities was performed. Therefore, infectious, inflammatory, and inherited vascular

etiologies could not be definitively excluded. In addition, the approximately 1-month follow-up period was insufficient to evaluate long-term recurrence or collateral revascularization.

Conclusions

Intercostal artery pseudoaneurysm is an uncommon yet clinically significant etiology of hemothorax and its early manifestations can mimic infectious pulmonary disease. No traumatic or iatrogenic trigger was identified in the present case, and the underlying etiology remained unclear. Clinicians should have a heightened suspicion for a vascular bleeding source when patients with presumed pneumonia develop worsening chest or back pain with progressive hemorrhagic pleural effusion. In such scenarios, timely contrast-enhanced CT and angiography facilitate accurate diagnosis, and endovascular embolization offers an effective minimally invasive therapeutic strategy. This report underscores the necessity of sustained clinical vigilance for vascular etiologies among patients presenting with atypical or evolving pleural disease.

Acknowledgments

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Department and Institution Where Work Was Done

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Ethics Approval and Consent for Publication

This case report was reviewed and approved by the Ethics Committee of Shandong Provincial Hospital Affiliated to Shandong First Medical University, Jinan, China (approval no. SWY2026-105). Written informed consent for publication of this case report and the accompanying de-identified images was obtained from the patient's parent/legal guardian.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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