Received: October 14, 2025
Accepted: December 4, 2025

Acad Med J 2025;5(3):206-210
UDC: 616.25-003.219-053.2
https://www.doi.org/10.53582/AMJ2553206s
Case report

FROM DIAGNOSIS TO LIFE-SAVING INTERVENTION - PNEUMOTHORAX DETECTION USING FAST IN A RESOURCE-LIMITED EMERGENCY UNIT: A CASE REPORT

Sulejmani Haris[1], Brzanov Nikola[1,2], Brzanov Gavrilovska Aleksandra[1,2], Golubikj Sanja[3]

[1]Faculty of Medicine, Ss. Cyril and Methodius University in Skopje, Republic of North Macedonia
[2]University Clinic for Traumatology, Orthopedic Disease, Anesthesiology, Reanimation and Intensive Care Medicine and Emergency Department, Faculty of Medicine, Ss. Cyril and Methodius University in Skopje, Republic of North Macedonia
[3]University Clinic for Pediatric Surgery, Faculty of Medicine, Ss. Cyril and Methodius University in Skopje, Republic of North Macedonia
e-mail: sulejmani.haris@hotmail.com

Abstract

Introduction: Tension pneumothorax is a life-threatening pediatric emergency that requires rapid recognition and intervention. In resource-limited environments, bedside extended Focused Assessment with Sonography for Trauma (eFAST) can provide a rapid and reliable diagnosis when advanced imaging is unavailable.

Case report: We report the case of a 13-year-old boy who developed acute respiratory distress after a fall form height. Bedside eFAST revealed absence of lung sliding and a barcode sign on M-mode, consistent with pneumothorax. Immediate needle decompression was followed by tube thoracostomy, with computed tomography confirming a right-sided pneumothorax and hemothorax. The patient recovered fully and was discharged after two weeks.

Conclusion: This case underscores the value of eFAST as a rapid, accurate, and life-saving diagnostic tool in resource-limited emergency settings, where timely bedside imaging can guide intervention before advanced imaging is available.

Keywords: pediatric pneumothorax, eFAST, point-of-care ultrasound, trauma, resource-limited settings

Introduction

Traumatic injuries remain a leading cause of morbidity and mortality among children worldwide. Although thoracic trauma is less frequent in pediatric patients than in adults, it poses substantial risk when complications such as tension pneumothorax occur[1]. This life-threatening condition results from the accumulation of intrapleural air, causing mediastinal compression, impaired venous return, and potential cardiovascular collapse if not promptly treated[2].

Point-of-care ultrasonography (POCUS), particularly the extended Focused Assessment with Sonography for Trauma (eFAST), has emerged as an essential bedside diagnostic tool for detecting pneumothorax and guiding emergent intervention[3,4]. In resource-

limited emergency departments, eFAST bridges the diagnostic gap where access to computed tomography (CT) is delayed or unavailable.

We present a pediatric case in which eFAST enabled rapid diagnosis and life-saving management of traumatic pneumothorax, underscoring the utility of bedside ultrasound in acute trauma care under resource constraints.

Case report

A previously healthy 13-year-old boy was brought to the Emergency Surgical Center following a fall from height. On arrival, he was conscious, alert, and oriented. Initial vital signs showed oxygen saturation of 97%, blood pressure of 125/90 mmHg, and heart rate of 100 beats per minute. Two large-bore intravenous cannulas were inserted, blood samples obtained, and intravenous fluids initiated.

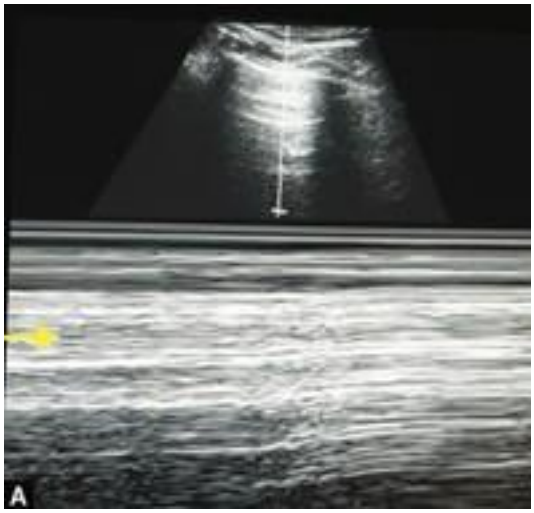

Fig. 1A. Seashore sign on M-mode ultrasonography demonstrating normal lung sliding, confirming intact pleural apposition

Fig. 1B. Barcode sign (stratosphere sign) indicating absent lung sliding, consistent with pneumothorax

During evaluation, the patient developed sudden chest pain, dyspnea, cyanosis, and jugular venous distension. Repeat assessment revealed hypotension (87/65 mmHg), tachycardia (144 bpm), and hypoxemia (83%). Auscultation demonstrated absent breath sounds over the

right hemithorax. Although the extended eFAST was not yet part of a standardized trauma protocol in our center, a trained physician performed immediate bedside ultrasound.

On M-mode imaging, the *seashore sign* (Figure 1A) normally indicates intact pleural apposition. In this patient, eFAST revealed absent lung sliding and a *barcode sign* (Figure 1B), consistent with pneumothorax. Emergency needle decompression using a 16G cannula at the second intercostal space, midclavicular line, resulted in immediate air release and clinical improvement.

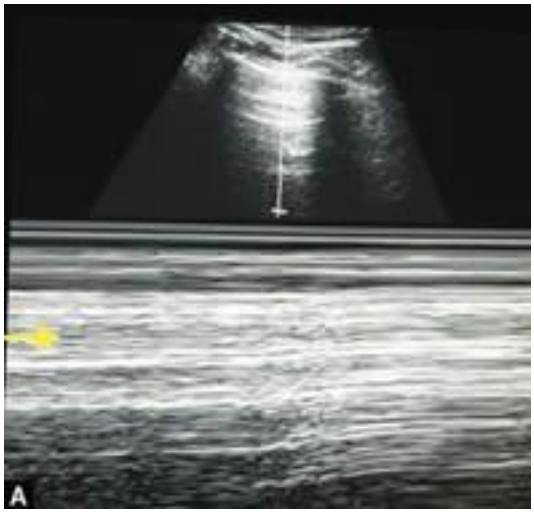

Fig. 2. Pulmonary CT findings

The pediatric surgical team subsequently inserted a chest tube with underwater seal drainage. Computed tomography confirmed a right-sided pneumothorax with associated hemothorax but no rib fractures or visceral injuries (Figure 2). The patient stabilized in the intensive care unit, was later transferred to the surgical ward, and was discharged uneventfully after two weeks.

Discussion

Tension pneumothorax remains a critical pediatric emergency in which even short delays in recognition can be fatal. While clinical signs such as hypotension, tachycardia, hypoxemia, and absent breath sounds are important, point-of-care ultrasound has markedly improved the speed and accuracy of diagnosis in unstable patients.

This case illustrates that the extended eFAST can rapidly confirm life-threatening thoracic injury before radiography or computed tomography (CT) becomes available. Previous studies have demonstrated comparable accuracy between ultrasound and supine chest radiography for pneumothorax detection, with the additional advantages of immediacy and bedside applicability[5]. Although CT remains the diagnostic gold standard, its use in hemodynamically unstable pediatric patients is often limited by transfer logistics and radiation exposure[6,7].

Ultrasound is particularly beneficial in resource-limited environments where advanced imaging is not readily accessible[8]. eFAST allows for prompt recognition of pneumothorax, guides emergency interventions such as decompression, and facilitates clinical decision-making without delay. Prehospital studies further corroborate its utility, with paramedics achieving successful early identification of pneumothorax using portable devices[9].

The diagnostic reliability of thoracic POCUS for traumatic pneumothorax has been reported with sensitivity up to 89% and specificity of 96%[12]. In middle-income settings,

structured implementation of FAST protocols has improved early detection of thoracic injuries and reduced reliance on CT imaging[13,14].

This case underscores the importance of integrating eFAST into pediatric trauma workflows and ensuring adequate training in sonographic interpretation. Operator expertise remains essential for maintaining diagnostic accuracy; however, when used appropriately, eFAST can decisively alter outcomes by enabling timely decompression and stabilization in critically injured children.

Conclusion

In resource-limited emergency settings, the extended eFAST represents a reliable, accessible, and life-saving diagnostic modality. Its systematic integration into pediatric trauma care can accelerate recognition, guide immediate intervention, and ultimately improve survival outcomes in children with severe thoracic injuries.

Patient Perspective

The patient's legal guardians expressed relief that the diagnosis was made quickly and that timely treatment prevented a life-threatening outcome. They highlighted the importance of rapid bedside imaging in guiding emergency care and were satisfied with the communication and support provided throughout hospitalization.

Conflict of interest statement. None declared.
Written informed consent for publication was obtained from the patient.

References

1. American College of Surgeons. *ATLS® Student Course Manual*. 10th ed. Chicago, IL: American College of Surgeons; 2022.
2. Tintinalli JE, Stapczynski JS, Ma OJ, Yealy DM, Meckler GD, Cline DM. *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*. 9th ed. New York, NY: McGraw-Hill Education; 2020.
3. Kirkpatrick AW, Sirois M, Laupland KB, Liu D, Rowan K, Ball CG, *et al*. Hand-held thoracic sonography for detecting post-traumatic pneumothoraces: the extended focused assessment with sonography for trauma (EFAST). *J Trauma* 2004; 57(2): 288-295. doi: 10.1097/01.TA.0000133565.88871.E4.
4. Volpicelli G, Elbarbary M, Blaivas M, Lichtenstein DA, Mathis G, Kirkpatrick AW, *et al*. International evidence-based recommendations for point-of-care lung ultrasound. *Intensive Care Med* 2012; 38(4): 577-591. doi: 10.1007/s00134-012-2513-4.
5. Blaivas M, Lyon M, Duggal S. A prospective comparison of supine chest radiography and bedside ultrasound for the diagnosis of traumatic pneumothorax. *Acad Emerg Med* 2005; 12(9): 844-849. doi: 10.1197/j.aem.2005.05.005.
6. Pearce MS, Salotti JA, Little MP, McHugh K, Lee C, Kim KP, *et al*. Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study. *Lancet* 2012; 380(9840): 499-505. doi: 10.1016/S0140-6736(12)60815-0.
7. Kirkpatrick AW, McKee JL, McKee I, Brown R, Gao J, Nicolaou S. Focused assessment with sonography in trauma (FAST) in children: a narrative review. *Pediatr Emerg Care* 2021; 37(1): 50-56. doi: 10.1097/PEC.0000000000002060.
8. Becker TK, Gaspari RJ. Use of ultrasound in the developing world. *Int J Emerg Med* 2009; 2(3): 193-195. doi: 10.1007/s12245-009-0104-8.

9. Heegaard W, Hildebrandt D, Spear D, Chason K, Nelson B, Ho J, *et al*. Prehospital ultrasound by paramedics: results of field trial. *Acad Emerg Med* 2010; 17(6): 624-630. doi: 10.1111/j.1553-2712.2010.00774.x.
10. Ma OJ, Mateer JR. Trauma ultrasound examination versus chest radiography in the detection of pneumothorax. *Ann Emerg Med* 1995; 26(4): 485-489. doi: 10.1016/S0196-0644(95)70117-4.
11. Scalea TM, Rodriguez A, Chiu WC, Brenneman FD, Fallon WF, Kato K, *et al*. Focused assessment with sonography for trauma (FAST): results from an international consensus conference. *J Trauma* 1999; 46(3): 466-472. doi: 10.1097/00005373-199903000-00022.
12. Brzanov N, Labacevski N, Antovik S, Stoilkovska B, Petrova E. Thoracic point-of-care ultrasonography: a reliable diagnostic technique for traumatic pneumothorax. *Int J Recent Res Arts Sci* 2024; 18: 9-17.
13. Brzanov N, Labacevski N, Antovik S, *et al*. Implementation of focused assessment with ultrasonography in trauma patients in a university surgical emergency department. *Maced J Anesth* 2023; 7: 54-63.
14. Brzanov N, Antovik S, Labacevski N, *et al*. Challenges in implementing FAST in resource-limited settings. Presented at: 16th International Medical and Health Sciences Research Congress 2024.