Section: Emergency Medicine

Case Series

TRAUMATIC PNEUMOTHORAX AND HEMOPNEUMOTHORAX FOLLOWING BLUNT THORACIC TRAUMA IN THE EMERGENCY MEDICINE DEPARTMENT: A CASE SERIES OF 7 PATIENTS

Kanthala Santhosh Kumar[1], Boina Venkatesh[2], Thammineni Sruthi[3], Shirisha G[4], Kollikonda Mahendra Kumar[5], Sette Vijaya[6], Pranav Kumar[7]

[1,2,3,4]Assistant Professor, Department of Emergency Medicine, Mamata Medical College, Khammam, Telangana 507002, India.
[5]Professor and HOD, Department of Emergency Medicine, Mamata Medical College, Khammam, Telangana 507002, India.
[6,7]Junior Resident, Department of Emergency Medicine, Mamata Medical College, Khammam, Telangana 507002, India.

Received *: 15/07/2026*
Received in revised form *: 10/08/2026*
Accepted *: 24/08/2026*

Corresponding Author:
Dr. Kanthala Santhosh Kumar,
Assistant Professor, Department of Emergency Medicine, Mamata Medical College, Khammam, Telangana 507002, India.
Email: santhoshreddi@gmail.com

DOI: 10.70034/ijmedph.2026.3.804

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 5212-5218

ABSTRACT

Background: Blunt thoracic trauma from road traffic accidents and falls from height is a common cause of traumatic morbidity and mortality. Traumatic pneumothorax and hemopneumothorax are among the most serious pleural sequelae, demanding prompt emergency intervention. Data from non-metropolitan emergency departments in South India remain limited.

Case Presentations: We report 7 patients (6 males, 1 female; age range 26–54 years) who presented to the Emergency Medicine Department following blunt thoracic trauma. All seven patients sustained their injuries in road traffic accidents. All patients presented with chest pain, dyspnea, and reduced or absent breath sounds over the affected hemithorax. Rib fractures were confirmed in all cases. Injury patterns included unilateral pneumothorax (2 patients), hemopneumothorax (3 patients), bilateral hemopneumothorax (1 patient), and bilateral hemothorax without pneumothorax (1 patient). Intercostal chest drain insertion was required in 6 of 7 patients; the remaining patient, who had an isolated splenic laceration, was managed non-operatively. Associated injuries included traumatic brain injury in one patient, humeral fracture in one, and Grade III splenic laceration in one.

Conclusion: Blunt thoracic trauma produces a wide spectrum of pleural injuries, most requiring ICD insertion in the emergency department. Associated extra-thoracic injuries add significantly to management complexity. CT imaging is indispensable for complete injury characterization, including identification of occult pneumothorax, splenic laceration, and traumatic brain injury.

Keywords: blunt chest trauma; traumatic pneumothorax; hemopneumothorax; intercostal chest drain; rib fractures; emergency medicine.

INTRODUCTION

Thoracic injuries account for approximately 25 to 30 percent of all trauma-related deaths worldwide. Road traffic accidents (RTAs) are the single largest contributor, with thoracic trauma identified as a direct cause of death in nearly 20 percent of trauma fatalities. A multicenter observational study encompassing 176,346 trauma patients found that 3.6 percent sustained significant thoracic injury, with chest wall fractures present in over 62 percent of RTA-related cases; multiple rib fractures accounted for more than half of these.[1] In low- and middle-income countries such as India, the burden is disproportionately high, driven by poor road infrastructure, high two-wheeled vehicle usage, and suboptimal helmet compliance. Falls from height constitute the second most common mechanism of blunt thoracic trauma, particularly among manual labourers, construction workers, and the elderly.

Traumatic pneumothorax results from air entering the pleural space after disruption of the parietal or

visceral pleura by fractured rib ends, direct lung laceration, or a sudden rise in intrathoracic pressure against a closed glottis. It is estimated to occur in approximately one-third of patients sustaining thoracic trauma.[2] A significant proportion of traumatic pneumothoraces are not visible on supine chest radiography—a finding termed occult pneumothorax—and are detectable only on CT. In a retrospective study at a Level 1 trauma center, occult pneumothorax accounted for 71.7 percent of all pneumothorax cases among patients with blunt chest trauma, underscoring the diagnostic limitations of plain radiography alone.[3] Hemothorax, defined as blood in the pleural cavity, results most commonly from intercostal vessel injury or lung laceration. The combination of blood and air in the pleural space—hemopneumothorax—is frequently encountered in high-energy blunt trauma and requires drainage of both components for adequate pulmonary re-expansion.

Rib fractures are the most frequent finding in blunt thoracic trauma, occurring in over 10 percent of all trauma admissions.[4] Their clinical significance extends beyond local pain: rib fractures impair chest wall excursion, cause splinting and atelectasis, and may lacerate underlying lung parenchyma, intercostal vessels, or abdominal viscera. The number of fractured ribs correlates with morbidity and mortality; patients with eight or more rib fractures have a mortality exceeding 34 percent in some series. Bilateral rib fractures and flail chest represent the severe end of this spectrum and often necessitate ICU admission and ventilatory support. Pain from rib fractures reduces chest wall excursion and predisposes to retained secretions, pneumonia, and respiratory failure—a risk compounded in elderly patients with baseline pulmonary disease. In the present series, rib fractures were identified in all seven patients, ranging from a single-rib fracture to bilateral multiple rib fractures at several levels, and were invariably accompanied by pleural space injury.

Intercostal chest drain (ICD) insertion is the cornerstone of emergency management for significant traumatic pneumothorax and hemothorax. Current guidelines recommend ICD for any hemothorax exceeding 300 mL, any pneumothorax causing cardiorespiratory compromise, or combined hemopneumothorax.[5] Initial drainage output exceeding 1,500 mL, or ongoing drainage of more than 200 mL per hour over four hours, is an indication for urgent thoracotomy. The insertion site for needle thoracocentesis is the 2nd intercostal space in the mid clavicular line for tension pneumothorax and drain site is fourth or fifth intercostal space in the midaxillary line for hemothorax or combined injury—is determined by injury pattern. In resource-limited emergency settings, clinical assessment and plain chest radiography may constitute the entire initial diagnostic armamentarium, and speed of ICD insertion is often more important than selection of drain caliber.

Associated extra-thoracic injuries are common in high-energy blunt trauma. Traumatic brain injury (TBI) impairs airway protective reflexes and alters neurological status, complicating airway management and hemodynamic monitoring. Abdominal injuries—particularly to solid organs such as the spleen and liver—may be clinically silent at presentation yet cause secondary hemorrhagic shock. In patients with lower rib fractures, the risk of concurrent splenic or hepatic injury rises substantially, mandating CT evaluation whenever the mechanism of injury suggests high-energy transfer. Orthopedic injuries must not distract from the primary survey, and their management must be coordinated with thoracic and neurosurgical priorities.

Effective management of blunt thoracic trauma requires a structured trauma approach. The primary survey must address airway, breathing, and circulation before proceeding to injury characterization. In non-metropolitan emergency settings—where on-site cardiothoracic surgery, intensive care capacity, and blood products may be limited—early recognition of immediately life-threatening injuries is critical. Tension pneumothorax, massive hemothorax, and cardiac tamponade must be identified and treated without delay; needle decompression or ICD insertion must not await imaging when these diagnoses are clinically suspected. Bedside ultrasound as part of the extended FAST examination allows rapid point-of-care detection of hemothorax and pneumothorax when CT is not immediately available.

There is limited published data from non-metropolitan emergency departments in South India describing the clinical profile and outcomes of blunt thoracic trauma. This case series presents 7 consecutive patients managed at the Emergency Medicine Department of a multi-specialty hospital, with the aim of documenting the injury patterns, emergency management strategies, and short-term outcomes encountered in this setting.

Case Series

Case 1:

A 52-year-old male presented to the emergency department after sustaining blunt trauma to the right side of chest and right forearm following a road traffic accident. He had been given primary first-aid at a government hospital before being referred for further management. There was no history of loss of consciousness, ENT bleed, vomiting, or seizures. On arrival, he was conscious, coherent, and oriented, with a GCS of 15/15. Vitals recorded were temperature 96.7°F, blood pressure 190/110 mmHg, pulse rate 94/min, and SpO_2 97% on supplemental oxygen. Examination revealed abrasions over the right axillary and clavicular regions, with subcutaneous emphysema and reduced air entry on the right side of the chest; the abdomen was soft and non-tender, and there was no palpable deformity of the limbs or spine.

Initial imaging, including a bedside ultrasound and chest X-ray, raised suspicion of a right-sided pneumothorax with subcutaneous emphysema, and this was further characterized on HRCT of the chest, which confirmed a right pneumo-hemothorax with associated rib fractures. Given these findings, the patient was taken up for insertion of a right-sided intercostal drainage (ICD) tube, which formed the primary therapeutic intervention (Figure 1). The procedure was performed under aseptic precautions with appropriate positioning and confirmation of tube placement, and the patient tolerated it well without immediate procedural complications. Following ICD insertion, he was managed supportively with analgesics for pain control, monitoring of respiratory parameters and vital signs, and control of elevated blood pressure noted at presentation.

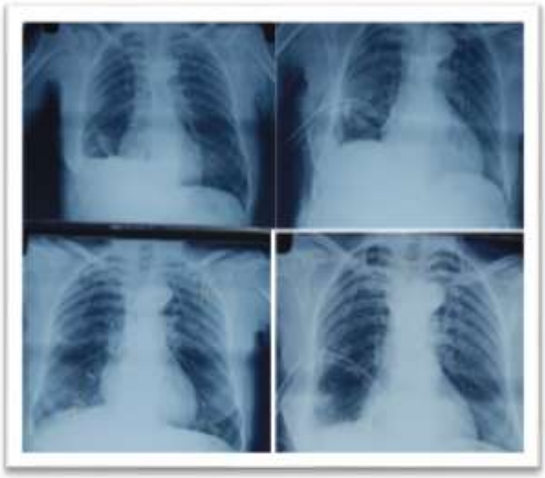

Figure 1: Chest imaging X-ray showing (Clockwise from left upper corner) –Right-sided pneumo-hemothorax, ICD inserted and seen in situ, Resolution of pneumohemothorax with ICD in situ, ICD removed.

Over the course of hospital stay, the patient showed steady clinical improvement, with resolution of respiratory distress and progressive lung re-expansion, allowing for safe removal of the ICD tube on day 6, prior to discharge. He remained hemodynamically stable throughout, with no further episodes of desaturation or hemodynamic compromise. At the time of discharge, he was ambulatory, comfortable, and clinically stable, with a clean surgical wound and no evidence of active drainage or infection, and was advised outpatient follow-up.

CASE 2

A 51-year-old male was brought to the Emergency Department following a road traffic accident in which he sustained bilateral chest wall injuries and left lower limb pain. On arrival, temperature was 36.5°C, pulse rate was 94 per minute, blood pressure was 110/70 mmHg, and oxygen saturation was 97 percent on supplemental oxygen. Random blood glucose was 120 mg/dL.

Respiratory examination revealed bilaterally reduced breath sounds. Bedside ultrasound, Chest radiography and CT of the chest demonstrated bilateral hemopneumothorax with bilateral rib fractures.

Bilateral intercostal chest drains were inserted in the Emergency Department. He was admitted and managed over six days with supportive care, oxygen therapy, and analgesia. He was partially improved at the time of discharge; attendants elected to leave against medical advice and the patient was referred for outpatient follow-up.

Case 3

A 40-year-old male was brought to the Emergency Department after falling from a two-wheeled vehicle at high speed during the early morning hours. He sustained injuries to the head, chest, and abdomen.

On arrival he was confused and his vitals - pulse rate 108 per minute, blood pressure 100/60 mmHg, respiratory rate 15 per minute, and oxygen saturation 97 percent on supplemental oxygen. Core temperature was 35.7°C. Capillary blood glucose was critically low at 39 mg/dL and was corrected immediately with intravenous 25% dextrose. Chest auscultation revealed diminished breath sounds on the left, bedside ultrasound and chest radiograph showed left-sided pneumothorax.

CT of the brain revealed mild subarachnoid hemorrhage. CT of the chest confirmed left-sided pneumothorax with rib fractures. CT of the abdomen was performed to exclude intra-abdominal injury. A left ICD was inserted under aseptic conditions in the Emergency Department. [Figure 2]

Figure 2: Chest radiograph showing a left-sided intercostal drainage (ICD) tube in situ following insertion for traumatic pneumothorax.

Treatment included intravenous mannitol 20%, levetiracetam 1gm, sodium valproate 300 mg, intravenous fluids and antibiotics. The patient was partially improved, and he was referred to a center with neurosurgical and cardiothoracic capabilities.

Case 4

A 41-year-old female was brought to the Emergency Department as a medicolegal case following a road traffic accident. She reported right-sided chest pain and dyspnea. She was hemodynamically stable on arrival.

CT of the brain was normal, excluding intracranial injury. CT of the chest revealed minimally displaced fractures of the right 6th rib (anterior aspect), right 7th and 8th ribs (anterolateral aspect), and right 5th, 9th, and 10th ribs (posterior aspect). Bilateral minimal hemothorax was identified without pneumothorax. Atelectatic changes were noted in the posterobasal segment of the right lung. CT of the abdomen and pelvis demonstrated a 40 × 13 mm subcapsular non-enhancing hypodense lesion at the inferior pole of the spleen, consistent with a Grade III splenic laceration. Given hemodynamic stability, she was managed non-operatively with close monitoring, analgesia, and serial abdominal assessment.

Case 5

A 30-year-old male presented to the emergency department following a road traffic accident, having sustained blunt trauma to the right side of the chest. He was brought in by attendants a short while after the incident, with the history suggesting a high-impact collision. There was no history of loss of consciousness, ENT bleed, vomiting, or seizures, and no other significant past medical history was noted. On examination, he was conscious, coherent, and cooperative, oriented to time, place, and person, with a GCS of 15/15 and stable vitals. Local examination of the chest revealed tenderness and bruising over the right side, with diminished air entry and clinical suspicion of an underlying rib injury.

Bedside ultrasound & bedside Chest radiography confirmed a displaced fracture of the right 2nd rib along with a right-sided hemopneumothorax secondary to the trauma. In view of these findings, the patient was taken up for tube thoracostomy under local anesthesia, which served as the primary and definitive intervention for evacuation of the hemopneumothorax and re-expansion of the underlying lung. The procedure was performed under aseptic precautions, with the intercostal drainage tube secured in position and connected to an underwater seal drainage system (Figure 3). The patient tolerated the procedure well, with no immediate intra-procedural complications, and was managed thereafter with analgesics, chest physiotherapy, and close monitoring of vitals and drain output.

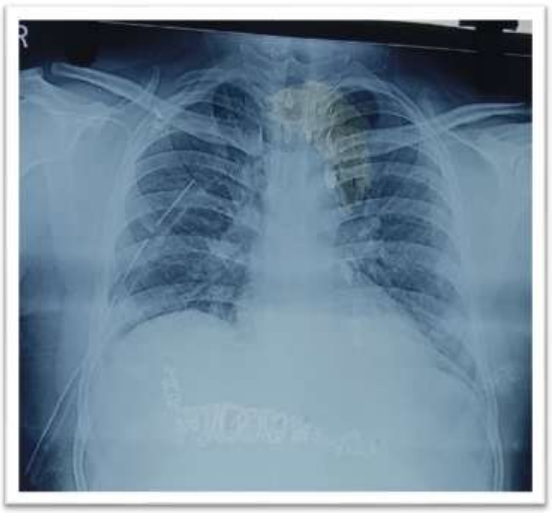

Figure 3: Chest imaging showing ICD in situ with resolution of hemopneumothorax and re-expansion of the underlying lung

On the day of the procedure itself (post-operative day 0), the patient remained conscious, coherent, and cooperative, with stable vitals, and the treating team continued the same line of management with serial monitoring for adequate lung re-expansion, drain output, and resolution of hemopneumothorax on follow-up imaging. The patient was planned for step-wise removal of the intercostal drain once lung expansion was radiologically confirmed and drain output fell within acceptable limits, followed by discharge with advice for outpatient follow-up.

Case 6

A 54-year-old male presented to the emergency department following a road traffic accident, with a history of polytrauma involving multiple sites. He gave a history of blunt trauma to the right side of the chest along with associated injuries to the right upper limb, back, and head sustained at the time of the accident. There was no history of loss of consciousness, ENT bleed, vomiting, or seizures reported by the attendants. On examination, he was conscious and hemodynamically stable, with tenderness and reduced air entry over the right side of the chest, deformity of the right clavicle and right forearm, tenderness over thoracolumbar spine region, and a swelling over the parietal-occipital region of the scalp.

Provisional diagnosis was polytrauma with right-sided 3rd, 4th, 5th, and 6th rib fractures with hemothorax and pneumothorax, along with a fracture of the right clavicle, a right radial shaft fracture, a comminuted fracture of the D11 vertebra, and a subgaleal hematoma over the parietal-occipital region. Chest imaging confirmed right-sided hemopneumothorax, and in view of this, the patient was taken up for right-sided intercostal tube drainage under local anesthesia as the priority intervention for airway and chest stabilization, with the orthopaedic and spine injuries planned for staged management once the patient was hemodynamically stabilized.

The procedure was performed with the patient in the supine position after standard aseptic preparation and draping. A 1 cm stab incision was made at the 5th intercostal space in the right mid-axillary line within the triangle of safety, and the incision was deepened through the subcutaneous tissue until the ribs were palpated. Blunt finger dissection was carried through the intercostal muscles into the pleural cavity, with a gush of air noted on entry confirming pneumothorax. A 32 Fr intercostal drainage tube was then inserted into the right pleural cavity and connected to an underwater seal drainage system, with hemostasis secured. Adequate column movement was observed in the drain, along with drainage of serosanguinous fluid, confirming correct intrapleural placement. A post-procedure chest X-ray was obtained to confirm tube position and lung expansion, and the drain was fixed securely to the skin with a silk suture.

Following the procedure, the patient was managed with analgesics, monitoring of drain output and respiratory parameters, and supportive care for the associated orthopaedic and vertebral injuries, with further definitive management of the clavicle fracture, radial shaft fracture, and vertebral fracture planned in a staged manner once the chest condition stabilized. He was followed up closely for resolution of the hemopneumothorax and adequate lung re-expansion prior to any further surgical intervention.

Case 7

A 26-year-old male presented to the emergency department following a road traffic accident, with a history of polytrauma sustained at the scene. He gave a history of blunt trauma to the right side of the chest along with associated facial and limb injuries. There was no history of loss of consciousness, ENT bleed, vomiting, or seizures. On examination, he was conscious, coherent, and cooperative, with stable vitals, but had reduced air entry and tenderness over the right side of the chest, deformity and tenderness over the left upper arm, and swelling with malocclusion over the lower jaw.

Provisional diagnosis was polytrauma with a moderate right-sided pneumothorax with associated pneumomediastinum, a fracture of the left humerus (proximal shaft, mildly displaced), and a comminuted fracture of the mandible involving the body and parasymphyseal region with a displaced fracture of the left condylar process, with no other significant associated skeletal or visceral injury detected on further imaging. In view of the respiratory compromise, the patient was taken up for right-sided tube thoracostomy under local anesthesia as the priority intervention, with the humerus and mandible fractures planned for staged definitive management once he was stabilized.

The procedure was performed with the patient positioned appropriately after standard aseptic preparation. Under local anesthesia, 2% xylocaine was infiltrated over the right 4th intercostal space in the mid-axillary line, and a 1.5 cm skin incision was given. The subcutaneous tissue was dissected over the right 4th rib, and a tract was formed by blunt dissection into the pleural cavity. A 28 Fr intercostal drainage tube was introduced into the right pleural cavity and secured at the 12 cm mark, followed by suturing and application of a sterile dressing. The procedure was uneventful, and the patient remained hemodynamically stable throughout.

Post-procedure, the patient was maintained on 5 L/min supplemental oxygen via face mask, with vitals recorded as blood pressure 130/90 mmHg, pulse rate 120/min, SpO_2 100% on 5 L/min oxygen, and respiratory rate 20/min. On auscultation, improved breath sounds were noted over the right infra-axillary and inframammary areas following tube placement. He was monitored with serial tube thoracostomy checks — tube patency, drain output, column movement, and bilateral air entry — all of which remained satisfactory in the immediate post-procedure period, and he was planned for further management of the humerus and mandibular fractures once respiratory status remained stable.

DISCUSSION

This case series describes 7 patients with blunt thoracic trauma presenting to a multi-specialty hospital emergency department. The cohort was predominantly male (6/7), with an age range of 26 to 54 years. All seven cases were due to road traffic accidents. This male predominance and mechanism profile mirrors multicenter epidemiological data, where males in the working-age group constitute the majority of RTA-related thoracic trauma victims. Rib fractures were present in all seven patients and represented the most consistent injury across the series.

Intercostal chest drain insertion was performed in 6 of 7 patients. Bertoglio et al,[6] reviewed the indications and technique for chest drain placement in trauma and concluded that prompt drainage is critical for hemostasis and restoration of pulmonary expansion. In Case 4—the only patient in whom ICD was not inserted—the decision to observe was supported by hemodynamic stability and CT characterization of injury. Shandilya et al,[7] conducted a prospective study from North India comparing conservative management and ICD in blunt chest injury patients with three or fewer rib fractures and found no significant difference in outcomes; however, their cohort excluded patients with hemodynamic compromise—a critical distinction from the majority of cases in the present series, where physiological instability was the rule. Banks et al,[8] demonstrated no significant difference in outcomes between observation and tube thoracostomy for small traumatic pneumothoraces, supporting selective non-operative management in hemodynamically stable patients.

Molnar,[9] noted that ICD size and insertion site should be individualized to the injury pattern: a smaller caliber drain placed anteriorly suits pure pneumothorax, while a large-bore drain in the

midaxillary line is preferred for hemothorax or hemopneumothorax. In this series, pragmatic application of these principles in a resource-limited emergency setting was associated with partial improvement in the majority of patients, consistent with outcomes reported in the literature.

Patients with multiple bilateral rib fractures (Case 2 in this series) experienced a more complex clinical course, requiring bilateral ICD insertion and a prolonged admission before referral. Marasco et al,[10] noted a trend toward less invasive management of flail chest injuries with regional analgesia and surgical rib fixation in appropriately selected patients; however, ICD remains non-negotiable in the acute emergency phase whenever pneumothorax or hemothorax is present.

Case 4 (the single female patient) presented with a distinctive injury pattern: six fractured ribs on the right (ribs 5, 6, 7, 8, 9, and 10), bilateral minimal hemothorax without pneumothorax, and a Grade III splenic laceration (40 × 13 mm subcapsular lesion at the splenic inferior pole). Blank and de Moya,[11] emphasized that lower rib fractures should prompt immediate evaluation for hepatic and splenic injury, as these injuries may be clinically silent at presentation. In this case, the splenic laceration was identified incidentally on CT obtained for thoracic assessment; without CT, the abdominal injury would have been missed. She was managed non-operatively given hemodynamic stability, which is the accepted approach for isolated Grade III splenic lacerations in stable patients.

Case 3 illustrates the management complexity of combined thoracic and intracranial trauma. The 40-year-old male arrived with hemodynamic compromise (blood pressure 100/60 mmHg), concurrent hypoglycemia (capillary glucose 39 mg/dL), and hypothermia (temperature 35.7°C), in addition to left pneumothorax and traumatic intracranial hemorrhage. Managing these competing priorities simultaneously—airway control, pneumothorax drainage, intracranial hypertension, and glycaemic emergency—demanded coordinated multi-team input. Tran et al,[12] highlighted that evolving management of traumatic pneumothorax increasingly incorporates CT-guided decision-making; however, in hemodynamically unstable patients such as Case 3, ICD insertion preceded CT completion.

Intepe and Akbiyik,[13] identified the number of fractured ribs and the presence of associated injuries as key determinants of outcome in rib fracture patients. This is consistent with the pattern observed in this series: cases with bilateral multiple rib fractures showed more severe physiological derangement, more complex interventions, and more prolonged emergency department stays than those with limited or unilateral fractures.

This case series has several limitations. First, the retrospective design and reliance on emergency department records means that some clinical variables could not be confirmed for all cases. Second, follow-up data beyond the initial admission or referral were not available for most patients. Finally, this series represents a single-center experience at a non-metropolitan hospital, limiting generalizability. Prospective multicenter studies are needed to generate stronger evidence on outcomes in this population.

CONCLUSION

Blunt thoracic trauma following road traffic accidents and falls from height produces a wide spectrum of pleural injuries, including pneumothorax, hemothorax, and hemopneumothorax. Rib fractures are a universal finding and serve as markers of injury severity. Intercostal chest drain insertion remains the primary emergency intervention for significant pleural space disruption. Associated injuries—including traumatic brain injury, splenic laceration, and humeral fracture—demand systematic imaging, multi-specialty coordination, and individualized management. Concurrent metabolic derangements can complicate recovery even after the thoracic injury is addressed.

Declarations

Source of funding: None

Conflict of interest: None

Consent: Obtained

REFERENCES

1. Benhamed A, Ndiaye A, Emond M, et al. Road traffic accident-related thoracic trauma: epidemiology, injury pattern, outcome, and impact on mortality — a multicenter observational study. PLoS One. 2022;17(5):e0268202. doi:10.1371/journal.pone.0268202. PMID: 35522686.
2. Anderson DE, Kocik VI, Rizzo JA, et al. A narrative review of traumatic pneumothorax diagnoses and management. Med J (Ft Sam Houst Tex). 2023;(Per 23-1/2/3):3-10. PMID: 36607292.
3. Kim CW, Park IH, Youn YJ, Byun CS. Occult pneumothorax in blunt thoracic trauma: clinical characteristics and results of delayed tube thoracostomy in a level 1 trauma center. J Clin Med. 2023;12(13):4333. doi:10.3390/jcm12134333. PMID: 37445368.
4. Kozanli F, Güler Ö. Effect of the presence of rib fracture on mortality and morbidity in blunt thoracic traumas. Ulus Travma Acil Cerrahi Derg. 2022;28(4):440-446. doi:10.14744/tjtes.2020.55710. PMID: 35485510.
5. Beyer CA, Ruf AC, Alshawi AB, Cannon JW. Management of traumatic pneumothorax and hemothorax. Curr Probl Surg. 2025;63:101707. doi:10.1016/j.cpsurg.2024.101707. PMID: 39922629.
6. Bertoglio P, Guerrera F, Viti A, et al. Chest drain and thoracotomy for chest trauma. J Thorac Dis. 2019;11(Suppl 2):S186-S191. doi:10.21037/jtd.2019.01.53. PMID: 30906584.
7. Shandilya S, Roy S, Rai A, et al. A prospective observational study on the outcome assessment of conservative management versus intercostal drainage (ICD) in blunt chest injury patients with ≤3 rib fractures in a North Indian tertiary care center. Cureus. 2023;15(7):e42167. doi:10.7759/cureus.42167. PMID: 37602137.
8. Banks KC, Mooney CM, Mazzolini K, Browder TD, Victorino GP. Comparison of outcomes between observation and tube thoracostomy for small traumatic pneumothoraces. Am J Emerg Med. 2023;66:36-39. doi:10.1016/j.ajem.2023.01.017. PMID: 36680867.

9. Molnar TF. Thoracic trauma: which chest tube when and where? Thorac Surg Clin. 2017;27(1):13-23. doi:10.1016/j.thorsurg.2016.08.003. PMID: 27865322.
10. Marasco SF, Nguyen Khuong J, Fitzgerald M, et al. Flail chest injury — changing management and outcomes. Eur J Trauma Emerg Surg. 2022;49(2):1047-1055. doi:10.1007/s00068-022-02152-1. PMID: 36318281.
11. Blank JJ, de Moya MA. Traumatic pneumothorax and hemothorax: what you need to know. J Trauma Acute Care Surg. 2026;100(1):12-17. doi:10.1097/TA.0000000000004692. PMID: 40604368.
12. Tran J, Haussner W, Shah K. Traumatic pneumothorax: a review of current diagnostic practices and evolving management. J Emerg Med. 2021;61(5):517-528. doi:10.1016/j.jemermed.2021.07.006. PMID: 34470716.
13. Intepe OG, Akbiyik AG. Single-center experience in cases with rib fractures: when to be alert? Cureus. 2023;15(12):e50060. doi:10.7759/cureus.50060. PMID: 38186497.