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OPTIMIZING OUTCOMES IN GERIATRIC BLUNT THORACIC TRAUMA: INSIGHTS FROM A MULTIDISCIPLINARY NON-OPERATIVE APPROACH – A CASE REPORT

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ABSTRACT

Blunt thoracic trauma significantly contributes to morbidity and mortality among the geriatric population, often arising from falls or motor vehicle accidents. These demographic faces unique challenges due to age related physiological changes and comorbidities. This report describes a case of a 71-year-old male pedestrian who sustained blunt thoracic trauma after being struck by a vehicle. The patient initially received care at a local clinic but developed worsening chest pain and shortness of breath within 24 hours. A chest X-ray revealed a right pneumothorax and extensive subcutaneous emphysema, while computed tomography confirmed multiple rib fractures, a flail chest, pneumomediastinum, and bilateral lung contusions. The patient required intubation due to severe respiratory distress and was subsequently admitted to the intensive care unit. Management involved a multidisciplinary approach focusing on pain optimization and aggressive chest physiotherapy. Unfortunately, the patient developed ventilator-associated pneumonia two days after extubating, necessitating re-intubation and tracheostomy. The patient was discharged in stable condition on day 26 post-trauma. This case highlights the complexities of managing blunt thoracic trauma in elderly patients and underscores the critical role of a multidisciplinary approach. Timely imaging, early ICU support, and a multidisciplinary care strategy are critical for optimizing outcomes in elderly patients with severe thoracic trauma, especially those complicated by flail chest and pulmonary contusions. Given the significant risks associated with surgical procedures in elderly patients, the non-operative approach emerges as the preferred strategy for managing geriatric chest trauma.

1.0 INTRODUCTION

Blunt thoracic trauma is a well-established contributor to morbidity and mortality among geriatric patients. Such injuries may arise from relatively minor incidents, such as falls, or more significant events, like motor vehicle collisions, mainly due to the age-related decline in judgment and acute response capabilities among older adults. The most frequently encountered types of blunt thoracic injuries include simple rib fractures, flail chest, sternal fractures, pulmonary contusions, haemothorax, pneumothorax, and cardiac contusions. The management of geriatric trauma is complicated by physiological changes associated with aging, which can exacerbate underlying comorbidities and lead to atypical presentations of chest injuries. Consequently, a multidisciplinary team approach is recommended for the effective management of traumatic rib fractures in geriatric patients. Optimal treatment for these fractures typically emphasizes non-surgical interventions, focusing on pain management and respiratory rehabilitation.

2.0 CASE REPORT

A 71-year-old man arrived at the Emergency Department 24 hours following a reported motor vehicle accident, during which he was struck while walking; however, the specifics of the incident remained unclear. Immediately after the accident, he sought treatment at a private clinic, where a laceration on his

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right forearm was sutured, and he was subsequently discharged. The following day, he experienced worsening shortness of breath and chest pain, accompanied by swelling in the chest wall and neck. He presented to a nearby district hospital, where he was diagnosed with a right pneumothorax and extensive subcutaneous emphysema as in Figure 1.

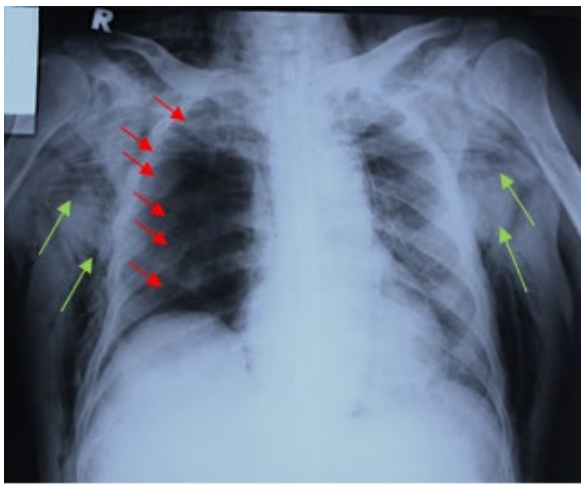

Figure 1. CXR done in district hospital showing 2nd – 7th right rib fracture (red arrow), extensive subcutaneous emphysema (green arrow), and right pneumothorax

A right tube thoracostomy was performed, after which he was transferred to a tertiary hospital for advanced management. Notably, he had no significant pre-existing medical conditions, was an ex-smoker with a history of 11 pack-years, and retained independence in daily activities classified as NYHA class I.

Upon arrival at the Emergency Department, the patient exhibited restlessness and tachypnoea. His vital signs indicated a blood pressure of 109/66 mmHg, a heart rate of 113 beats per minute, a respiratory rate of 40 breaths per minute, and an oxygen saturation of 98 % while receiving high-flow oxygen (15 L/min); he was afebrile. Due to significant respiratory distress, he was promptly intubated using rapid sequence intubation. Examination of the chest revealed extensive subcutaneous emphysema in the right upper and lateral chest extending to the neck, with a functioning thoracostomy tube in place. Auscultation revealed diminished air entry on the right side, while other clinical findings, including a focused assessment with sonography in trauma (FAST), were unremarkable. Post-thoracostomy, the patient's chest X-ray (CXR) is illustrated in Figure 2.

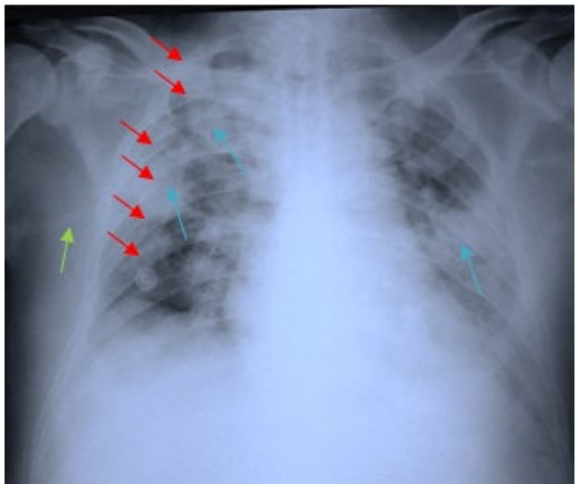

Figure 2. CXR post insertion of tube thoracostomy (green arrow), 2nd–7th right ribs fracture (red arrow), expanding right lung, bilateral lungs contusion (blue arrow)

A computed tomography (CT) scan of the thorax subsequently confirmed rib fractures, including a flail segment of the right second to seventh ribs, a posterior right first rib fracture as in Figures 3, 4, and 5, and left fifth and seventh rib fractures as in Figure 6. The CT also indicated the presence of

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pneumomediastinum, bilateral lung contusions, and right subcutaneous emphysema. CT scans of the brain and abdomen were within normal limits.

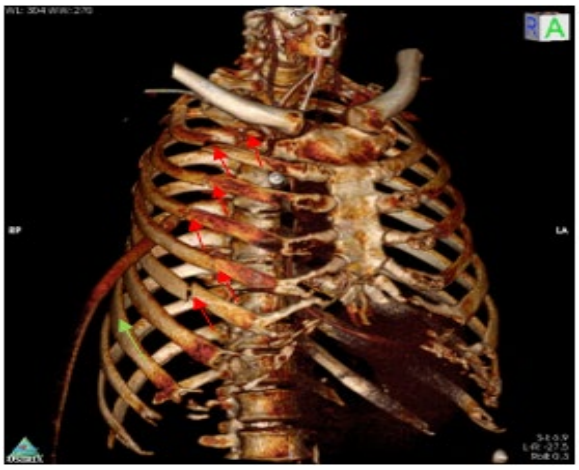

Figure 3. 3-D reconstruction CT thorax showing right anterior 2nd–7th ribs fracture (red arrow) and tube thoracostomy in situ (green arrow)

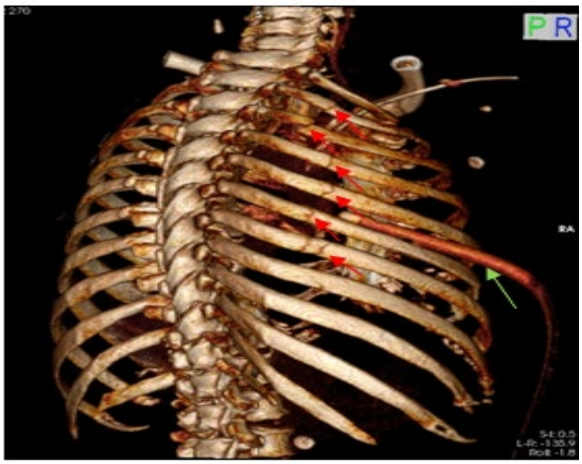

Figure 4. 3-D reconstruction CT thorax showing Right posterior 2nd–7th ribs fracture (red arrow) and tube thoracostomy in situ (green arrow)

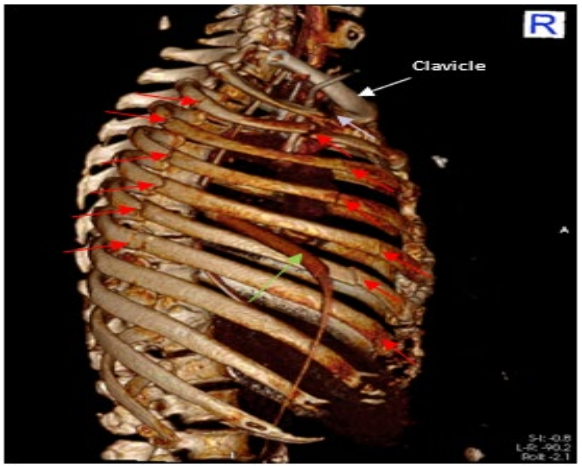

Figure 5. 3-D reconstruction CT thorax showing 1st rib fracture (purple arrow), displaced fracture of ribs 2nd–7th with flail segment motion (the red arrows), and tube thoracostomy in situ (green arrow)

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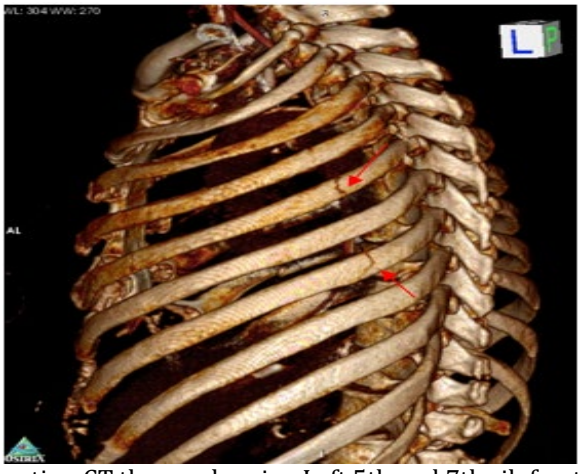

Figure 6. 3-D reconstruction CT thorax showing Left 5th and 7th rib fracture (red arrow) – not visualized on CXR

The patient was admitted to the intensive care unit (ICU) for ventilatory support and initiated on a comprehensive multidisciplinary care approach tailored specifically to address the complexities of his severe chest injuries. The management focused on analgesia optimization, respiratory therapy, and oxygenation support. Regular administration of subcutaneous morphine was utilized for effective pain management. On day six post-trauma, the anaesthetist team successfully extubated the patient and transitioned him to a 50 % venturi mask, which they subsequently weaned to supplemental oxygen via nasal cannula. The patient's oxygenation levels remained stable throughout this period, leading to the removal of the chest tube on day 8. Regrettably, post chest tube removal, he developed ventilator-associated pneumonia, resulting in respiratory distress and type 1 respiratory failure, requiring re-intubation and 7-day course of intravenous Cefepime. The subsequent day, he underwent a percutaneous tracheostomy to facilitate prolonged intubation.

Following the tracheostomy, the patient was managed on continuous positive airway pressure (CPAP) for five days. By day 15 post-trauma, ventilator support was discontinued, and his oxygenation was adequately maintained with supplemental oxygen via a tracheostomy mask. Throughout his stay in the ICU, he received aggressive chest physiotherapy, incentive spirometry, and a lung hygiene care bundle. He was transferred to the general ward on day 18 post-trauma, where he continued to improve with the addition of encouragement of ambulation and optimization of analgesia transitioning from patient-controlled analgesia (PCA) to oral pain medications. He was ultimately discharged home in stable condition without the tracheostomy or oxygen supply on day 26 post-trauma, with planned follow-up at the surgical outpatient clinic.

3.0 DISCUSSION

Asia is experiencing an unparalleled demographic transition marked by a swiftly aging population. According to the projections of the Department of Statistics Malaysia (DOSM), the proportion of citizens aged 65 and older is expected to increase substantially, rising from 8.1 % in 2024 to 14.5 % by 2040 [1]. These growing elderly population will consequently alter healthcare demands, particularly in Malaysia's trauma management realm. The Pan Asian Trauma Outcome Study (PATOS) registry for the years 2015-2018 reported that 27.1 % of trauma patients were older adults aged over 65 years [2]. Among older adults, falls accounted for 66.3 % of trauma incidents, making them the predominant cause of rib fractures in this demographic [2]. The PATOS data also indicated that older trauma patients face a higher hospital mortality rate of 1.5 %, compared to 0.9 % for younger adults, and they tend to have prolonged lengths of stay in both hospitals and intensive care units (ICUs).

While rib fractures may be well tolerated in younger patients, they pose substantial morbidity and mortality risks for the geriatric population. In individuals over 65 years of age, the risk of pneumonia increases by 27 %, and the mortality risk rises by 19 % with each rib fracture [3]. The complications related to rib fractures are primarily attributed to pain-induced hypoventilation, which can lead to pneumonia and respiratory failure. Non-operative management of rib fractures in elderly patients is supported by multiple studies and meta-analyses, which highlight the limited evidence and inherent risks of surgical fixation in

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this population [4-6]. The lack of consensus on surgical technique, timing, and applicability in elderly patients further underscores the preference for non-operative management for geriatric patient [7]. Therefore, the primary objective of managing geriatric rib fractures is to optimize analgesia to facilitate respiratory rehabilitation and prevent pulmonary complications via non-operative approach. This is best achieved through a multidisciplinary team approach involving emergency physicians, trauma surgeons, geriatricians, anaesthesiologists, respiratory therapists, and mid-level nursing practitioners.

3.1 Early Recognition

In a hospital setting, comprehensive patient care should begin with identifying individuals with high-risk rib fractures and the effective management of pain in the Emergency Department. Emergency physicians must maintain a heightened level of suspicion for potential respiratory complications following blunt thoracic trauma, particularly in geriatric patients. Validated scoring systems in managing these individuals are crucial, as they assist in triage, assessment, and treatment escalation. Significant risk factors for the development of complications following blunt thoracic trauma can often be identified through thorough history-taking and clinical examination [8]. These risk factors include the patient's age, the number of rib fractures (with more than four being associated with markedly increased morbidity and mortality), the presence of chronic lung disease, the use of pre-injury anticoagulants, and oxygen saturation levels.

Appropriate imaging is essential in the evaluation of elderly patients with thoracic trauma, as it contributes to both diagnosis and prognostication. As illustrated in our case, plain radiographs (CXR) have limitations and failed to reveal a flail segment involving the second to seventh right ribs, which was identified through computer tomography (CT) imaging. CT thorax offers a more precise assessment of the number and location of rib fractures and other concomitant thoracic injuries [9]. In our patient, we were able to diagnose a right flail chest, a first right rib fracture, left fifth and seventh rib fractures, residual pneumothorax, pneumomediastinum, and bilateral lung contusions solely from the CT images and 3-D CT reconstruction. These injuries significantly elevate the patient's morbidity and mortality rates.

3.2 Pain Control Strategies

Assessing and managing pain in geriatric trauma patients can be challenging, yet it is critically important. Adequate pain control following blunt thoracic trauma is essential for promoting ventilation, minimizing splinting and atelectasis, and reducing the risk of pneumonia. Research indicates that the intensity of acute pain experienced within the first two weeks following a rib fracture is a significant predictor of both chronic pain and disability [10]. Thus, the primary objectives of analgesia are to facilitate pain-free respiratory rehabilitation which includes pulmonary hygiene, chest physiotherapy, and mobilization to prevent secondary pulmonary complications while minimizing systemic side effects [6].

There are various strategies available for pain management in geriatric trauma patients. Intravenous opioids and patient-controlled analgesia can be effective; however, their application may be limited due to potential central nervous system side effects and respiratory depression. Given this complexity, the early involvement of an acute pain management team and anaesthesiologist is vital for implementing multimodal analgesia. Regional anaesthesia techniques, such as thoracic epidural, paravertebral block, and novel myofascial block, provide targeted pain relief but are not devoid of risks, including hypotension and hematoma, particularly in anticoagulated patients [6-11]. One significant benefit of regional anaesthesia is its potential to decrease opioid consumption and reduce the incidence of delirium in elderly patients with rib fractures [12].

3.3 Chest Physiotherapy for Pulmonary Hygiene

The objective of aggressive chest physiotherapy is to prevent complications such as atelectasis and pneumonia. The most effective strategy for achieving this involves encouraging deep breathing, facilitating active coughing, and addressing any underlying pulmonary conditions [13]. A combination of interventions, including incentive spirometry, aerosolized pharmacologic therapies (e.g., 3% saline), mucolytic agents, active cycle of breathing techniques, and early mobilization and cough support [14] has been associated with a reduction in the duration of mechanical ventilation and a decreased length of stay in both the ICU and hospital settings [15-16].

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3.4 Mode of Oxygenation

In patients with high-risk rib fractures who experience persistent hypoxemia despite chest physiotherapy, early initiation of non-invasive mechanical ventilation combined with regional anaesthesia is more effective than a high-flow nasal cannula in reducing the incidence of pneumonia and decreasing the need for mechanical ventilation by 40% [17]. Expert practice guidelines recommend the use of non-invasive ventilation for older adults aged 65 and above who present with three or more rib fractures [18]. In the case discussed the patient was subjected to early ventilation due to respiratory distress and subsequently required re-intubation following pneumonia complications, which extended his length of stay in both the ICU and hospital.

4.0 CONCLUSIONS

Blunt thoracic trauma can lead to substantial morbidity and mortality, particularly among geriatric patients. It is crucial to anticipate, diagnose, and manage direct injuries and sequelae, such as pneumonia, as early as possible through clinical judgment and objective scoring systems. A comprehensive understanding of the unique challenges associated with geriatric trauma is essential for effective management. In the case of our patient, despite a delayed presentation to the tertiary hospital and the presence of high-risk rib fractures within the elderly population, he experienced an excellent recovery during his hospital stay due to a multidisciplinary approach. While complications should be prevented whenever possible, it is essential to mitigate their effects if they do occur. The main strategies for non-operative management of geriatric rib fractures include optimizing pain control, implementing aggressive chest physiotherapy, and employing non-invasive ventilation for oxygenation. In the long term, effective early pain management is vital to prevent chronic pain and enhance the quality of life. Each multidisciplinary team member involved in this non-operative clinical approach must clearly understand their role to ensure successful patient recovery and minimize morbidity and mortality.

5.0 CONFLICT OF INTEREST

The authors declare no conflict of interest.

6.0 AUTHORS' CONTRIBUTION

Ramli, S. I. (Writing of original draft, Critical revision of content)

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