



Outcome of Supportive Care in Traumatic Lung Contusions: A Pilot Study at a Tertiary Care Hospital

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Abstract

Introduction: Lung contusion is a traumatic lung hemorrhage associated with edema without evidence of any parenchymal laceration. It is a common clinico-pathological entity in trauma and frequently seen in thoraco-abdominal and isolated thoracic trauma.

The outcome remains highly unpredictable and the expectant treatment remains the standard of care.

Methods: We included a total of 200 patients of chest trauma with solitary and multiple lung contusions. The patients were closely monitored and managed conservatively with standard supportive care. Patients having any emergent surgical indication other than tube thoracostomy were excluded from the study. The clinical course and the effectiveness of conservative treatment were analyzed.

Results: Majority of the patients had a favorable clinical course with standard supportive care.

The initial blood gas parameters had a direct bearing on the clinical course and outcome and appeared to be reasonable prognostic factors.

The intermediate period of injury remains the most unpredictable one.

The associated co-morbidities emerged as more significant prognosticators than associated subtle trauma. Lung rupture is a rare but fatal complication.

Conclusion: Lung contusion remains the entity with unpredictable clinical course. However a rationalized supportive care shifts the paradigm more towards the predictability.

Early anticipation of deterioration and prompt supportive therapeutic remain the key components of good clinical outcome.

Keywords: Chest trauma; Lung contusion; Clinical course; Supportive care

Introduction

Pulmonary contusions are the most common parenchymal lung injury seen in blunt thoracic trauma, present in about 25% to 35% of cases [1]. It is the most common type of lung injury in blunt chest trauma with a reported prevalence of 17% to 70% [2].

Blunt thoracic trauma can lead to many serious outcomes. Of these, pulmonary contusion can lead to significant morbidity and mortality if not recognized early and managed appropriately [3].

The histopathological pattern of pulmonary contusions consists of lesions of the alveolar-lining epithelial cells and vascular endothelial cells, with consequent intra-alveolar and interstitial edema and hemorrhage [4].

Clinical symptoms, including respiratory distress with hypoxemia and hypercarbia, peak at about 72 h after injury. The timely diagnosis of pulmonary contusion requires a high degree of clinical suspicion [5].

Alveolar hemorrhage and parenchymal destruction are maximal during the first 24 h after injury and then usually resolve within 7 days [6].

The severity ranges from mild to deadly, small contusions may have little or no impact on the patient's health, yet pulmonary contusion is the most common type of potentially lethal chest trauma. It occurs in 30% to 75% of severe chest injuries [7]. With an estimated mortality rate of

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14% to 40% [7], pulmonary contusion plays a key role in determining whether an individual will die or suffer serious ill effects as the result of trauma.

The combination of different arterial blood gas analysis variables may be a fast approach for identifying patients with lung injury in the setting of blunt chest trauma [8].

Of the conventional modalities of investigation, Computed Tomography is likely to accurately reveal the relevant chest injuries [9]. Computed Tomography (CT) is very sensitive for diagnosing pulmonary contusion [10].

Lung contusion occurs at the time of injury, but may be undetectable on chest radiography for the first 6 h after trauma. The pooling of hemorrhage and edema will blossom at 24 h, rendering the contusion radiographically more evident [2,9].

Although management of patients with pulmonary contusion is supportive and conservative, traumatic lung contusion may cause life-threatening complications and/or respiratory failure, including pneumonia, and adult respiratory distress syndrome with long-term disability [11].

Operative intervention is rarely necessary in blunt thoracic injuries. Most such injuries can be treated with supportive measures and simple interventional procedures such as tube thoracostomy [12].

Therapeutic options are limited to basic supportive measures such as mechanical ventilation, positive end expiratory pressure, invasive cardiopulmonary monitoring, analgesics and aggressive pulmonary hygiene [5,12]. Extracorporeal Membrane oxygenation is the only option in hypoxia refractory to invasive mechanical ventilation [13].

Methods

We studied a total of 200 patients admitted in the Department of Cardiovascular and Thoracic Surgery, Sheri Kashmir Institute of Medical Sciences, Srinagar. This included the patients admitted from August 2016 to July 2019. All the patients were diagnosed of isolated non penetrating chest trauma after being subjected to conventional assessment of trauma. For thoracic evaluation, a chest radio-graph and CT scan were done. Serial blood gas analysis and other Baseline Investigations were done.

The patients were observed in high dependency areas. Besides close clinical monitoring, blood gas parameters were analyzed at 2 to 3 hourly intervals for first 12 h of admission for critical patients needing high oxygen supplementation or assisted ventilation.

Patients with no signs of recovery, with abnormal blood gas parameters and those requiring persistently high flows of oxygen were subjected to review pulmonary CT angio investigation. A low threshold for assisted ventilation was considered in patients with no or less recovery than expected.

A higher class of antibiotics Piperacillin with Tazobactam along with Levofloxacin was administered empirically as prophylaxis to ARDS. All the patients were administered short course of steroids to alleviate bronchospasm. PTE prophylaxis was considered in high risk patients.

Both non invasive and invasive ventilation was offered as and where indicated.

Inclusion criteria

Patients with;

- 1) Unilateral or bilateral lung contusion(s) without any other injury.
- 2) Solitary or multiple lung contusions without any other injury.
- 3) Lung contusion(s) with mild to moderate hemo-pneumothorax.
- 4) Lung contusion(s) with undisplaced stable sternal fracture.
- 5) Lung contusion(s) with isolated rib fractures not requiring fixation.

Exclusion criteria

Patients with;

- 1) Extensive lung contusions with evidence of hypoxic brain injury.
- 2) Concomitant trauma to other organ(s).
- 3) Indications for Thoracotomy.
- 4) Flail chest, refractory to Mechanical ventilatory support.
- 5) Large retro-sternal hematomas/Evidence of cardiac trauma.
- 6) A history/documentation of very poor cardiopulmonary reserve.
- 7) Severe deliberating co-morbidities.

Results

The mean duration of Intensive Care admission was 6 days with 8 (4%) patients requiring ICU stay for more than a week? Two patients developed Acute Pulmonary Thromboembolism and one died. Another patient developed a huge pulmonary hematoma likely due to lung rupture and died peri-operatively. Eight (4%) patients developed ARDS out of which 6 (3%) died in ICU. Interestingly, seven of these eight patients had considerable cardiopulmonary comorbidities like COPD, Asthma, Treated Pulmonary Tuberculosis or cardiomyopathy.

22 (11%) patients needed Tube drainage for hemothorax while as 14 (7%) for pneumothorax and 48 (24%) for hemo-pneumothorax.

A total of 48 (24%) patients' required invasive mechanical ventilation while as 112 (56%) patients were managed by non invasive oxygen supplementation *via* a Venturi mask. The remaining 40 (20%) patients maintained oxygen saturation at room air and did not necessitate any oxygen supplementation.

The most common and persistent abnormality in blood gas analysis was hypoxia, although variable hypercarbia was associated with it.

Alveolar hemorrhage was associated with frequent episodes of hemoptysis and bronchospasm.

Small multifocal contusions in either or both of the lungs had more propensity to develop ARDS than large solitary contusions.

Late reactive pleural effusion was seen in 12 (6%) patients.

The overall mortality in our sample of patients was 4%.

Discussion

Overall outcomes after pulmonary contusion may be affected by the mechanism and pattern of injury [6]. Expectant supportive care can be considered a good treatment strategy in patients with lung

contusions [11,12]. Most of the patients with isolated traumatic lung contusions do not have immediate surgical indications. In a report by Michael Gibson et al. [7], only 8% of cases with blunt thoracic injuries required an immediate operation.

Therapeutic options are limited to basic supportive measures such as mechanical ventilation, positive end expiratory pressure, invasive cardiopulmonary monitoring, analgesics and aggressive pulmonary hygiene [14]. Treatment is primarily supportive and patients are treated with supplemental oxygen and mechanical ventilation whenever indicated [10]. Potential complications are pneumonia, progression to ARDS, and rarely lung rupture [15]. ECMO is an emerging high end treatment modality for severe and refractory cases [13].

Conclusion

Lung contusions are commonly encountered thoracic injuries in the setting of industrial and automobile advancement and in warfare. Apparently normal looking chest wall often masks grave lung injuries within it.

Lung contusions remain the most unpredictable injuries in terms of progression and behavior, with a wide clinical spectrum.

Prompt, aggressive and sustained supportive care is the only available and established modality of treatment.

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