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Result of Concomitant Occult Pneumothorax and Hemothorax in traumatic Patients requiring Ventilation

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Abstract

HPTX is a medical noteworthy problem; its control is not defined yet. Ribs injuries were noticed by gut CT examination, of which 26 had a pneumothorax (PTX) and 22 were distinct as occult HPTX. It is a "prospective observational study" which comprised all blunt trunk trauma patients who needed PPV or ventilator care for surgical process and presented with parallel HPTX by chest CT (not obvious on first supine trunk radiograph) from 2010 till 2012. An overall of 55 chest trauma patients who had occult HPTX and essential PPV were prospectively involved in the study. The average age of the patients was 34.8 ± 12.9 years and the common cases were males (97.2%). The mean ISS was 23.4 ± 8.7 and chest AIS was 23.3 ± 9.5. The median mechanical ventilation was 3 days and the length of stay in hospital was 18 days.

Keywords: AIS, ISS, PIX, HIX.

Introduction

Patients with more than one injury have a greater incidence of mortality and morbidity if the trauma consists of the thorax. Specifically, the reason for 10-20% of deaths is trauma. [1-3] The delay in the investigation and management of HPTX is mostly associated with numerous complications. [4] Although HPTX is a medical noteworthy problem, its control is not defined yet. [5-7] Rhea et al. reported 109 ribs injuries to be noticed by gut CT examination, of which 26 had a pneumothorax (PTX) and 22 were distinct as occult HPTX. [6] Unfortunately, the dimension of occult PTX or hemothorax (HTX) that permits the first drainage by using tube thoracostomy on primary appearance has not been well documented. deMoya et al. [8] planned an "objective scoring system" for measuring occult PTX which might hypothetically minimize the avoidable tube thoracostomy for minor occult PTX and maintained better organization decisions. Other investigators have defined both quantitative and

qualitative assessment of pleural fluid with erect chest radiographs as well as pleural sonogram. [9, 10] This lamella is noticeable on the upper body CT scan and the highest calculated thickness of the lamella could be measured as the reflection of whole effusion volume. [9, 11]

Conversely, current writings did not explain the management possibilities for occult PTX principally in patients who experienced PPV. [8] Therefore, the controlling of occult PTX is not sound defined. [12, 13] Besides, little is known about the management of parallel occult HPTX in ribs trauma patients who are exposed to PPV. We theorized that occult HPTX in patients with direct trauma who need PPV or ventilator care for the surgical process can be managed conventionally.

Methods

It is a "prospective observational study" which comprised all blunt trunk trauma patients who needed PPV or ventilator care for surgical process and presented with parallel HPTX by chest CT (not obvious on first supine trunk radiograph) from 2010 till 2012. The occurrence of HPTX was established by CT assessment and follow-up trunk radiographs were found to find out the development of HPTX during clinic stay. Suggestions for chest tube placement are respiratory settlement with oxygen desaturation as well as X-ray mark of or hemothorax or pneumothorax development (improved haziness with the destruction of both cardiophrenic and costophrenic and angles).

CT scan was employed to enumerate PTX by determining the largest upright space in millimeters from the trunk wall of the major air pocket. Hemothorax was assessed by calculating the "deepest lamellar fluid stripe" at the most reliant portion of the fluid pool (Figure 1). The analysis of pneumonia was ended based on purulent sputum, fever, etc. on "Siemens Medical Systems."

Statistical Analysis

The data were offered as ratios, mean or medians ± standard deviation, as suitable.

Patients were distributed into two clusters according to the necessity of chest tube addition or no-chest tube. Alterations indefinite variables were examined using the "chi-square test" and the constant variables were examined via "Student's t-test." A Nonparametric Mann-Whitney U test was implemented for skewed constant data. Two-tailed *P* values <0.05 were considered to be substantial. Data study was conceded out using the Statistical Set for the "Social Sciences version 18" (SPSS, Chicago, IL USA).

	Overall N=55	No-chest tube N=39%	Chest tube N=17%	p value
Males n. percentage	54 (97.2)	41 (100%)	14 (93.3)	0.85
Age	34.8 ± 12.9	37 ± 12.7	34.3 ± 14.1	0.09
Mode of injury n. percentage				
• Stab	2 (1.8)	0.9 (2.4)	1 (1)	
• Fall from height	17 (25.8)	12 (31.7)	2 (19)	
• Crash by motor vehicle	26 (45.6)	19 (48.8)	6 (34.3)	
• Pedestrian	11 (17.9)	5 (14.6)	3 (25.7)	
• Other	5 (7.1)	2 (2.4)	4 (21)	
No. of fractured ribs (median; range)	5 (1–7)	5 (1–6)	5 (1–7)	.60
Lung contusion n. percentage	46 (83.9)	32 (80.5)	13 (93.3)	0.24

Pneumothorax thickness (median; range)	11.5 (2–80)	11 (2–70)	11 (2–80)	0.11
Hemothorax thickness (median; range)	11 (1–40)	10 (1–21)	14 (1–40)	0.05
Chest AIS (mean ± SD)	4 ± 2.7	2.88 ± 0.27	2.83 ± 0.25	0.61
Injury severity score (mean ± SD)	23.4 ± 8.7	23.3 ± 9.5	23.9 ± 6.5	0.80
Days of Ventilation (median; range)	3 (1–23)	3 (1–21)	5 (1–20)	0.03
Surgical processes n. percentage	20 (33.9)	16 (41.5)	1 (13.3)	0.05
Mortality n. percentage	5 (7.1)	1 (4.9)	1 (13.3)	0.29
Acute Respiratory Distress Syndrome n. percentage	10 (16.1)	2 (7.3)	5 (40)	0.004
Ventilator associated pneumonia n. percentage	15 (28.6)	11 (29.3)	5 (26.7)	0.9

Result

An overall of 55 chest trauma patients who had occult HPTX and essential PPV were prospectively involved in the study. The average age of the patients was 34.8 ± 12.9 years and the common cases were males (97.2%). Motor vehicle crash (45.6%) and falls from height (25.8%) were the recurrent processes of injury (Table 1).

A chest tube was positioned in 17 patients (14 at ICU and 1 patient required PPV for operating intervention within 1–6 days of admission). Lung contusion (83.9%) signifies the most recurrent chest injury and 39 (71.4%) patients had multiple rib fracture with a median of 5 (1–7). On CT assessment, 45% of cases had HTX thickness of ≤10 mm, and 35% had a width between 11-16mm. The median HTX width was 11mm (range: 1–40). Likewise, the larger figure of patients (42%) had PTX thickness of ≤11 mm, monitored by 10 to 14mm (32%) and the median PTX thickness was 11mm (range: 2–80). Seven out of 55 patients had the abolition of costophrenic angle on monitoring trunk radiograph but were treated effectively expectantly. Thirty-seven (66%) patients needed mechanical ventilation and intubation due to injury on the head (GCS below 8) and the residual 20 (34%) patients needed general anesthesia for orthopedic, neurosurgical, or maxillofacial procedures.

The mean ISS was 23.4 ± 8.7 and chest AIS was 23.3 ± 9.5. The median mechanical ventilation was 3 days and the length of stay in hospital was 18 (range: 3–90) days. Ventilator related pneumonia was detected in ~30% of cases; ~17% had established ARDS and none of these cases were documented to have empyema. ARDS was described to occur before tube inclusion in the majority.

Table 1 showed a relationship between tube thoracostomy and conventionally treated patients. The two sets were similar for age, injury severity, number of fractured ribs, size presence of pulmonary contusions of PTX. However, time of mechanical aeration (6 (1–21) versus 4 (1–24); *P*=0.03, the width of HTX (14 (1–40) versus 10 (1–21); P=0.05 and rate of ARDS expansion (40% versus 7.3%; P=0.004 were meaningfully higher in patients who experienced tube thoracostomy associated with no-chest tube class.

The general rate of mortality was 7% and both groups were similar concerning the rate of mortality.

Discussion

To our knowledge, this is an irreplaceable study that emphasizes the control and result of occult HPTX in chest traumatic patients who require PPV. One of the significant findings of our training is that a higher percentage (73%) of chest traumatic patients with occult HPTX might be sensibly accomplished conventionally. Our findings are reliable with an earlier approaching multicenter training that established traditionalist management in 95% occult cases PTX. [14]

The greater rate of positive observation in that study is owing to the statement that they did not reveal concurrent HTX and PTX as informed in our series. However, the extent of HTX specifies development on follow-up and is related to the requirement of tube thoracostomy in our patients. Settlement of a thoracostomy tube is not lacking risk and could be complex in inadequate drainage.

Moreover, HTX might prime to respiratory failure/distress, fibrothorax, retained clot, empyema, and prolonged hospitalization. Ball et al. [13] described chief complications in 21% of cases that had tube thoracostomy.

Amusingly, the CT scan outcome for the controlling of occult PTX remains debatable. In 1993, Enderson et al. [12] stated the main randomized prospective study on traumatic patients with occult PTX to assess the effectiveness of tube thoracostomy. Likewise, other investigators have suggested upper body tube insertion in occult PTX patients that needed PPV as these patients are at better risk of developing tension PTX. [12, 16, 17]

We have frequently used the lower mean respiratory pressure (18.5) and variable crest (5-7 mL/kg) in our study. A researcher suggest that occult PTX does not relates to the progression of respiratory discomfort,[14] and those patients can be managed simply and safely without the need for PPV. Typically, every posttraumatic HTX case undergoes the tube thoracotomy for diagnosis. However, we tried to exceed by other possible designs. However, we are quite confident on our results that they will serve well in the management of HPTX patient. In the same way, other researchers also suggest this progressive management of isolated occult PTX [14] and occult HTX patients. As a result, patients with occult HPTX could be diagnosed by carefully searching for the chest trauma that needed positive pressure ventilation. Furthermore, delayed thoracotomy does not mean bad event. Though occult HPTX is unusual and infrequent, pressure awareness is important for the emergency physicians. By clear and deep observation, the use of tube thoracotomy could be reduced and minimized for those who had verified hemo- or increased size of chest or respiratory disorders. Therefore, the HPTX patients will not suffer potential difficulties of thoracotomy and ventilation. Moreover, possible randomly controlled studies are required for the assessment of larger occult hemothorax thickness in PPV needed patients, in addition to the establishment of clinical guidelines on CT scan volumetric calculations.

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