

The Comprehensive Analysis of Traumatic Rib Fractures and their Complications: A Post Mortem Study

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Abstract

Introduction: Rib fractures are the most common injury sustained following blunt chest trauma, accounting for more than half of thoracic injuries from non-penetrating trauma. Approximately 10% of all patients admitted after blunt chest trauma have one or more rib fractures [1]. In United States they account for 10% of traumatic injuries and 14% of all chest wall injuries. The incidence of flail chest is 10% to 15% of severe chest traumas [2].

Material and Methods: In this retrospective study, fatal cases of thoracic trauma autopsied during the period 1st January 2009 to 31st December 2010 were analyzed at the Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, Mandya District, Karnataka, India.

Results: In the present study, 31.3% of victims belong to the 3rd decade of life. Women were less involved than men with ratio of 1: 1.5. The mortality rate was 20.18%. The victims in most of the cases sustained non displaced rib fractures followed by displaced fractures. 5th rib fracture were seen in eight cases followed by 4th and 6th ribs fracture were seen in seven cases. The nature of death in most of the cases was accidental. The victims in most of the cases sustained road traffic accidental injuries followed by fall from height. Haemo-thorax was found in 27 cases and pneumo-thorax was seen in 20 cases.

Discussion: In the study done by Mehmet [3], 548 (38.7%) of the cases had rib fractures. There were 331 males and 217 females, with an overall mean age of 43 years (range: 5–78 years), the etiology of the trauma included road traffic accidents in 330 cases, falls in 122, assault in 54, and industrial accidents in 42 cases. Pulmonary complications such as pneumo-thorax (37.2%), hemo-thorax (26.8%), hemo-pneumothorax (15.3%), pulmonary-contusion (17.2%), flail chest (5.8%) and isolated subcutaneous emphysema (2.2%) were noted [3].

Conclusions: A rib fracture secondary to blunt thoracic trauma is an important indicator of the severity of the trauma. In the present study we explored the morbidity and mortality rates in patients with rib fractures. Finally, we come to a conclusion that blunt trauma patients sustaining more number of fractured ribs are always associated with higher mortality and morbidity rates owing to greater severity of internal organ injuries.

Keywords: Thoracic trauma; Rib fracture; Pneumo-thorax; Haemo-thorax

Introduction

A rib fracture is disruption in any of the 12 rib bones that form the rib cage. The disruption may be a single fracture of one rib, a single fracture of multiple ribs, or a rib or ribs may be broken into several pieces (comminuted fracture). The fourth through ninth ribs are the most commonly fractured, and fractures of the eighth through twelfth ribs are often a marker for abdominal organ injuries. Rib fractures are the most common injury sustained following blunt chest trauma, accounting for more than half of thoracic injuries from non-penetrating trauma. Approximately 10% of all patients admitted after blunt chest trauma have one or more rib fractures [1].

Incidence

In the United States they account for 10% of traumatic injuries and 14% of all chest wall injuries. The incidence of flail chest is 10% - 15% of severe chest traumas. Overall in the world the prevalence of rib fractures is linked to the prevalence of the underlying cause of the trauma. Rib fractures are more common in countries with higher incidence of motor vehicle accidents. Mortality/ morbidity correlates with the number of rib fractures and degree of injury to underlying structures [2].

Risk

Individuals at risk for chest trauma from work, recreational or athletic pursuits are more likely to sustain a rib fracture. 72% of rib fractures occur in men, possibly due to job requirements for heavy labor or participation in sport activities that create a greater risk for blunt trauma. Multiple rib fractures will often be associated with an underlying pulmonary contusion, which may not be immediately apparent on an initial chest X-ray. Fractures of the lower ribs may be associated with diaphragmatic tears and spleen or liver injuries [3].

Material and Methods

In this retrospective study, fatal cases of thoracic trauma autopsied

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Received September 21, 2011; **Accepted** October 07, 2011; **Published** October 15, 2011

Citation: Vijay Kumar AG, Shivaramu MG, Kumar U, Shridhar KC, Ajay Kumar TS (2011) The Comprehensive Analysis of Traumatic Rib Fractures and their Complications: A Post Mortem Study. J Forensic Res S2:004. doi:10.4172/2157-7145.S2-004

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during the period 1st January 2009 to 31st December 2010 were analyzed at the Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, Mandya District, Karnataka, India.

During this study several epidemiological observations and their results have been considered including the details about the type, nature and frequency of rib fractures and their complications.

Results

Table 1: In the present study, 31.3% of victims belong to the 3rd decade of life. Women were less involved than men with ratio of 1: 1.5.

Table 2: According to this study the mortality rate in rib fracture cases was 20.18%.

Table 3: The victims in most of the cases sustained non displaced rib fractures (37 cases; 55.2%) followed by displaced fractures (18 cases; 26.9%).

Table 4: 5th rib fracture were seen in 8 cases followed by 4th and 6th ribs fracture were seen in 7 cases.

Table 5: Nature of death in most of the cases were accidental (44 cases; 65.7%).

Table 6: The victims in most of the cases sustained road traffic accidental injuries (39 cases; 58.2%) followed by fall from height (18 cases; 26.8%).

Table 7: Haemo-thorax was found in 27 cases (40.3%) and pneumo-thorax was seen in 20 cases (29.9%).

Discussion

In the present study, 31.3% of victims belong to the 3rd decade of life. Women were less involved than men with ratio of 1: 1.5. The victims in most of the cases sustained non displaced rib fractures (37 cases; 55.2%) followed by displaced fractures (18 cases; 26.9%). In the study done by Mehmet. [3] 548 (38.7%) of the cases had rib fractures. There were 331 males and 217 females, with an overall mean age of 43 years(range:5-78 years)[3].

Age group	Male	%	Female	%	Total	%
<10	00	00	00	00	00	00
11-20	05	12.5	04	14.8	09	13.4
21-30	12	30.0	09	33.3	21	31.3
31-40	09	22.5	06	22.2	15	22.4
41-50	08	20.0	05	18.5	13	19.4
>60	06	15.0	03	11.1	09	13.4
Total	40	100	27	100	67	100

Table 1: Distribution of cases according to age and sex.

Total no. of rib fractures cases admitted in the hospital between January 2009 to 31 December 2010	332
Total no. of rib fractures cases autopsied in the hospital between January 2009 to 31 December 2010	67
percentage	20.18%

Table 2: Total number of rib fractures cases admitted in the hospital.

type of rib fractures	No. of cases	%
Non-displaced rib fracture	37	55.2
Displaced rib fracture	18	26.9
Comminuted rib fracture	12	17.9
Total	67	100

Table 3: Distribution of cases according to type of rib fractures.

ribs	side of rib fractures	
	Right side	Left side
1 st rib	0 cases	0 cases
2 nd rib	1 cases	0 cases
3 rd rib	2 cases	2 cases
4 th rib	4 cases	3 cases
5 th rib	4 cases	4 cases
6 th rib	3 cases	4 cases
7 th rib	2 cases	3 cases
8 th rib	1 cases	1 cases
9 th rib	1 cases	1 cases
10 th rib	0 cases	1 cases
11 th rib	1 cases	1 cases
12 th rib	1 cases	0 cases

Table 4: Distribution of cases according to side of rib fractures.

Nature of death	No. of cases	%
Accidental	44	65.7
Homicidal	13	19.4
Suicidal	10	14.9
Total	67	100

Table 5: Distribution of cases according to nature of death.

Manner of death	No. of cases	%
Road traffic injuries	39	58.2
Fall from height	18	26.8
Injuries by blunt weapon	06	08.9
Stab injuries	04	05.9
Total	67	100

Table 6: Distribution of cases according to manner of death.

Pleural cavity	No. of cases	%
Normal	07	10.5
Haemo-thorax	27	40.3
Pyo-thorax	13	19.4
Pneumo-thorax	20	29.9
Total	67	100

Table 7: Distribution cases according to condition of pleural cavity.

In the present study, 5th rib fracture were seen in eight cases followed by 4th and 6th ribs fracture were seen in seven cases. Nature of death in most of the cases was accidental (44 cases; 65.7%). The victims in most of the cases sustained road traffic accidental injuries (39 cases; 58.2%) followed by fall from height (18 cases; 26.8%). Haemo-thorax was found in 27 cases (40.3%) and pneumo-thorax was seen in 20 cases (29.9%). In the study done by Mehmet. [3] the etiology of the trauma included road traffic accidents in 330 cases, falls in 122, assault in 54, and industrial accidents in 42 cases. Pulmonary complications such as pneumo-thorax (37.2%), hemo-thorax (26.8%), hemo-pneumothorax(15.3%),pulmonary-contusion(17.2%), flail chest (5.8%) and isolated subcutaneous emphysema (2.2%) were noted [3].

In the present study the mortality rate was 20.18%. In the study done by Ziegler DW and Agarwal NN [4] on patients with rib fractures, the mortality rate reached 12%; of these, 94% had associated injuries and 32% had a hemo-thorax or a pneumothorax. [4] In the study done by Lotfipour. [5] on 99 elderly patients, 16% of patients developed adverse events, including 2 deaths. [5] Rib fractures are the most common injury in elderly blunt chest trauma patients, and each additional rib fracture increases the odds of dying by 19% and of developing pneumonia by 27% [6,7].

Conclusions

A rib fracture secondary to blunt thoracic trauma is an important indicator of the severity of the trauma. In the present study we explored the morbidity and mortality rates in patients with rib fractures. Finally, we come to a conclusion that blunt trauma patients sustaining more number of fractured ribs are always associated with higher mortality and morbidity rates owing to greater severity of internal organ injuries.

Competing Interests

The authors declare that they have no competing interests. Both authors have read and approved the final manuscript.

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