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Characteristics of Rib Fracture in Chest Trauma Cases through Clinical Forensic Medicine for Assessment Body Damage Rate

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Abstract

Objectives: To study characteristics of rib fracture in chest trauma cases through clinical forensic medicine for assessment body damage rate.

Subjects and methods: A cross-sectional descriptive study of 90 victims with rib fracture due to thoracic trauma assessed to determine the rate of body injury at the National Institute of Forensic Medicine of Vietnam from January 2018 to October 2022.

Results: The total of 90 cases of rib fracture, more than three ribs fracture accounted for the highest rate with 32 cases (35.55%), one rib fracture accounted for 26 cases (28.9%), three ribs fracture with 18 cases (20%), two ribs fracture accounted for the least with 14 cases (15.55%). Seventh rib was the most common fracture rib in the study with 42 out of 90 cases (51.57%), followed by eighth rib (40%), other rib fracture accounted for less, concentrated mainly around seventh and eighth ribs. The first rib is the least common fracture rib (2.22%). Lateral arch and anterior arch of ribs are the most common fracture sites with 26 cases (28.89%) and 24 (26.67%) respectively, posterior arch fractures account for a lesser proportion with 19 cases (21.1%), fracture combining multiple arcs of 21 cases (23.33%). The most common associated injury in rib fractures was pleural injury (28.89%), combined injuries in 21 cases (23.33%), 9 cases of lung parenchymal damage (10%), 6 cases of clavicle fracture (6.67%) and no related injuries (22.22%). In total of 60 cases asked to identify the injured object, the group that caused the injury was blunt objects with the majority of 57.78%; due to sharp objects were 6.67%, unknown cause of injury accounted for a low rate with 2.22%.

Keywords: Ribs fracture • Clinical forensic assessment

Introduction

Rib fracture is one of the most common injuries in chest trauma. Rib fracture in chest trauma caused by many reasons such as violence, playing sports, traffic accidents and daily life accidents... In clinical forensic assessment, the common cause of rib fracture is related to impact of external forces due to violence or traffic accidents. Determining the rate of bodily damage in clinical forensic assessment of rib fractures is often quite complicated, due to the need to determine the trauma sequelae and the object caused injury. In Vietnam at present, the forensic examination to determine the percentage of body injuries related to rib fracture in chest trauma is complied with by the forensic medicine experts in accordance with Circular No. 47/2013/TT-BYT dated December 31st, 2013 of the Ministry of Health [1]. The determination of body damage rate due to rib fracture is applied according to Section II. Injury to ribs, Chapter 3, Rate of bodily damage based on Table 1, Circular No. 22/2019/TT-BYT dated August 28th, 2019 of the Ministry of Health [2]. However, in the assessment process, there are also some difficulties, related to determining exactly whether there is a rib fracture, how many ribs are fractured and whether the rib fracture was caused by trauma or not. During the evaluation, the forensic experts need to be experienced, combined with the clinical indications and may have to conduct consultations with specialists to make the correct diagnosis. Up to now, the Vietnamese forensic profession has not had any research on the characteristics of rib fractures in clinical forensic medicine for assessment body damage rate. Therefore, we carried out the project "Characterization of rib fracture in chest trauma cases through clinical forensic medicine for assessment body damage rate" with the following objectives:

1. To describe the characterization of rib fracture in chest trauma cases through clinical forensic medicine for assessment body damage rate.
2. To determine the sequelae of trauma and the object causing the injury in cases of rib fracture.

Research Subjects

A total of 90 victims with rib fracture due to thoracic trauma assessed to determine the rate of body injury at the National Institute of Forensic Medicine of Vietnam from January 2018 to October 2022.

Selection Criteria

1. Cases were assessed the rate of body damage related to rib fracture due to chest trauma. During the assessment, there is a chest X-ray or a CT scanner of the chest to identify fracture ribs.
2. Cases must have medical records, assessment conclusions with rib fracture, full information as required by the research.

Exclusion Criteria

1. Cases that do not meet the selection criteria.
2. Non-traumatic rib fracture.

Research Methods

Study design

A cross-sectional descriptive study of 90 cases of rib fracture due to chest trauma assessed to determine the body damage rate at the National Institute of Forensic Medicine of Vietnam during the period from January 2018 to October 2022.

Method of proceeding

90 cases were requested for forensic examination to determine the rate of bodily damage. All cases were evaluated according to the assessment process including receiving dossiers from police, studying medical records, full body examination, injury examination, appointment of specialist examination if necessary, CT scanner and other laboratory tests, summarizing the results and finally the conclusion of the assessment.

Data analysis

The data were analyzed using Microsoft Excels 2013 software.

Research ethics

1. Collect honest data and research with integrity.
2. The information related to the research object is kept confidential, only for research purposes.
3. Research purposes are descriptive research, in order to improve the quality of forensic medicine assessment.

Results

Characteristics of rib fractures in chest trauma cases

Table 1. Number of rib fracture on victim.

Number of rib fracture	n	Percentage
1 rib	26	28.90%
2 ribs	14	15.55%
3 ribs	18	20.00%
>3 ribs	32	35.55%
Total	90	100%

The group of fractures on 3 ribs accounted for the highest rate with 32 cases (35.55%), 1 rib fracture accounted for 26 cases (28.9%), 3 rib fractures with 18 cases (20%), 2 ribs fracture accounted for the least with 14 cases (15.55%).

Table 2. Location of fracture ribs.

Location of fracture ribs	n	Percentage
1st rib	2	2.22%
2nd rib	13	14.40%
3rd rib	25	27.70%
4th rib	30	33.30%
5th rib	32	35.50%
6th rib	33	36.60%
7th rib	42	51.57%
8th rib	36	40.00%
9th rib	24	26.60%
10th rib	24	26.60%
11th rib	9	10.00%
12th rib	4	4.40%

The 7th rib is the most common fracture rib with 42/90 cases (51.57%), followed by 8th rib (40%), other ribs account for a lesser percentage, centered mainly around rib 7th, 8th and 1st rib are the least common fracture rib with 2/90 cases (2.22%).

Table 3. Location of fracture rib arch.

Location of fracture rib arch	n	Percentage
Anterior arch	24	26.67%
Posterior arch	19	21.10%
Lateral arch	26	28.89%
Combining multiple arcs	21	23.33%
Total	90	100%

Lateral arch and anterior arch are the 2 most common fracture sites with 26 cases (28.89%) and 24 (26.67%), posterior arch fractures account for less with 19 cases (21.1%), fracture combining multiple arcs of 21 cases (23.33%).

Table 4. Characteristics of rib fracture related to other injuries

Related to other injuries	n	Percentage
Pleural injury	26	28.89%
Lung parenchymal damage	9	10.00%
Clavicle fracture	6	6.67%
Other bone fracture	8	8.88%
Multiple combined lesions	21	23.33%
No injuries involved	20	22.22%
Total	90	100%

The most common associated injury in rib fractures in the study was pleural injury with 26/90 cases (28.89%), many combined injuries in 21 cases (23.33%), there were no related lesions in 20 cases (22.22%), lung parenchymal lesions in 9 cases (10%), clavicle fractures in 6 cases (6.67%).

Traumatic sequelae and injuries in rib fractures

Table 5. Characteristics of traumatic sequelae.

Traumatic sequelae	n	Percentage
Scars	26	28.89%
Sequelae of pleural adhesions	6	6.67%
Sequelae of damage to lung parenchyma	4	4.44%
Pleural residue	1	1.11%
No sequelae	60	66.70%

Cases with sequelae of trauma when assessed accounted for the highest rate with 60/90 cases (66.67%), wound or surgical scars with 26/90 cases (28.89%), pleura adhesions in 6/90 cases (6.67%), damage to lung parenchyma (4.44%), sequelae of pleural residue accounted for a low rate with 1/90 cases (1.11%).

Table 6. Classification by impact objects caused injury.

Injury impact objects	n	Percentage
Blunt objects	52	57.78%
Sharp objects	6	6.67%
Unknown objects	2	2.22%
Total	60	100%

Of the 60/90 cases asked to identify impact objects caused injury, the group that caused the injury was blunt object with the majority of 57.78% (52 cases), due to sharp objects (6.67%), unknown object accounted for a low rate with 2 cases (2.22%).

Discussion

Rib fractures usually affect the 5th and 6th ribs [3]. According to the results of our study (Table 1), the 7th rib was the most common fracture rib with 42/90 cases (51.57%), followed by the 8th rib fracture (40%), other ribs fracture accounted for a smaller proportion which concentrated mainly around ribs 7th, 8th, while the 1st rib was the least common fractured rib with 2/90 cases (2.22%). This result is also understandable because the closer the ribs are located in the middle of the ribcage, the wider the bone arch, the more likely it is to be affected by trauma causing fracture. The ribs from 1st

to 3rd rib are the hardest to break and are a sign of serious injury if broken. The ribs from 4th to 10th are usually the most vulnerable while the 11th rib and 12th are more mobile, therefore they harder to break [4]. The number of broken ribs, the number of broken points in a rib and the fracture location of the rib arch are always interested by doctors to assess the extent of damage and possible complications (Tables 1-3). The most feared complication of a rib fracture is a movable rib fracture. Mortality rates can range from 10%-15% in these cases [5].

Research results in Table 4 show that there were injuries associated with rib fracture in chest trauma, including pleural damage, lung parenchymal damage, clavicle fracture, other bone fracture, and multiple combined lesions. There were 60 out of 90 cases with traumatic sequelae caused by rib fracture detected on forensic medical examination (Table 5), including scars (28.89%), sequelae of pleural adhesions(6.67%), sequelae of damage to lung parenchyma (4.44%), pleural residue (1.11%). These sequelae are evaluated to rank the body damage rate, so forensic doctors need to examine thoroughly, prescribe subclinical or need to consult to evaluate all accompanying sequelae to avoid missing the victim's injury or affected to assess body damage rate.

In this study, we found that the object causing the injury was blunt object with the highest proportion with 57.78% (Table 6). The blunt objects are quite diverse such as hands and feet, stones, bricks, iron bars, sticks... to impact on the chest wall, or fall or due to the mutual impact caused by traffic collisions. This result is similar to the study of Kevin Kuo et al., most rib fractures were caused by trauma due to directly impact by the object to the chest area [4].

Conclusion

A total of 90 victims with rib fractures due to thoracic trauma assessed to determine the rate of body injury at the National Institute of Forensic Medicine of Vietnam:

1. Fracture on 3 ribs accounted for the highest rate with 35.55%.
2. 7th rib was the most common fracture rib with 51.57%, followed by 8th rib 40%.
3. Lateral arch and anterior arch were the two most common fracture sites with 28.89% and 26.67%; posterior arch fractures 21.1%, fracture combining multiple arcs 23.33%.
4. The most common associated injury in rib fractures in the study was pleural injury with 28.89%.
5. Cases with sequelae of trauma related to rib fractures with 66.67%.
6. Causes of the injury were blunt objects with the majority of 57.78% and sharp objects were 6.67%.

Acknowledgment

We thank the patient for allowing the case description.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

1. Circular No. 47/2013/TT-BYT dated December 31, 2013 of the Ministry of Health, Vietnam.
2. Circular No. 22/2019/TT-BYT dated August 28, 2019 of the Ministry of Health, Vietnam.
3. Nazal, Yasser. "Rib fracture: Different radiographic projections." *Med Sci Monitor* 77.4 (2012): 13-16.
4. Kevin, K and Amie M. Kim. Rib Fracture. Updated August 8, 2022.
5. Pettiford Brian L., et al. "The management of flail chest." *Thoracic surg clin.* 17.1 (2007): 25-33.

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