

ORIGINAL ARTICLE

COMPARISON OF OUTCOME BETWEEN LOW AND HIGH THORACIC TRAUMA SEVERITY SCORE IN BLUNT TRAUMA CHEST PATIENTS

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Background: Blunt chest trauma is second leading cause of death among trauma patients. Early identification and aggressive management of blunt thoracic trauma is essential to reduce the significant rates of morbidity and mortality. Thoracic trauma severity score (TTS) is a better predictor of chest trauma related complications. The objective of the study was to compare outcomes between low and high thoracic trauma severity score in blunt trauma chest patients. **Methods:** A cross sectional descriptive study was carried out in public and private sector hospitals of Rawalpindi, Pakistan from 2008 to 2012 and 264 patients with blunt trauma chest who reported to emergency department of the hospitals, within 48 hrs of trauma were recruited. All patients were subjected to detailed history and respiratory system examination to ascertain fracture ribs, flail segment and hemopneumothorax. Written and informed consent was taken from each patient. Permission was taken from ethical committee of the hospital. **Results:** The patients with blunt chest trauma had an array of associated injuries; however there were 70.8% of patients in low TTS group and 29.2% in high TTS group. Outcome was assessed as post trauma course of the patient. Outcome in low and high TTS group was compared using Chi square test which shows a significant relationship ($p=0.000$) between outcome and TTS, i.e., outcome worsened with increase in TTS. **Conclusion:** It is concluded that there is a significant relationship between outcome and thoracic trauma severity. Outcome of the patient worsened with increase in thoracic trauma severity score.

Keywords: Blunt chest trauma, Poly trauma, Thoracic trauma severity score, TTS, Pakistan

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INTRODUCTION

Blunt thoracic trauma is the second most common diagnosis, next to extremity injuries, in patients with poly trauma.¹ Isolated thoracic trauma was found in 67% and associated chest trauma occurred in 33% of patients with poly trauma.² In patients the mortality associated with thoracic injury is 7.8% and morbidity was seen in 21.3% patients.³ A composite score that should include several anatomical, radiographic, and physiologic criteria is required for improving diagnostic accuracy in blunt thoracic trauma cases.⁴ Early identification and aggressive management of blunt thoracic trauma is essential to reduce the significant rates of morbidity and mortality.⁵ This is important because the degree of chest trauma has significant impact on the requirements of resuscitation, intensive care unit support.⁶ Timely assessment of adequacy of treatment strategies will help in reducing various complications.⁷

Thoracic trauma severity score (TTS) is suitable for the judgment of osseous and parenchymal injuries and considers physiological parameters as well. This score evaluates five different parameters PaO_2/FiO_2 , rib fractures, pulmonary contusion, pleural involvement and age. TTS is better predictor of chest trauma related complications at the time of admission in emergency by using the parameters that are readily available i.e. Chest X-ray and arterial blood gases.^{8,9}

Early assessment of the severity and prediction of later complications of thoracic trauma can be done with this score; it helps in effective management plans.¹⁰ It is easy, reproducible and cost effective.

MATERIAL AND METHODS

This cross-sectional descriptive study was carried out in public and private sector hospitals of Rawalpindi, Pakistan from 2008 to 2012. Two hundred and sixty-four patients with blunt trauma chest who reported to emergency department of the hospitals, within 48 hrs of trauma were included. Patients with penetrating chest trauma, old chest trauma cases, operated and complicated chest trauma cases were excluded.

All patients were subjected to detailed history and respiratory system examination to ascertain fracture ribs, flail segment and hemopneumothorax. Chest radiographs were done and arterial blood gases were drawn in all patients on admission. The lung contusion was assessed by number of lobes involved. The diagnosis of chest wall injuries, parenchymal pulmonary injuries and pleural involvement, i.e., pneumothorax, hemothorax and hemopneumothorax were made on the basis of chest radiographs. PaO_2/FiO_2 horovitz quotient was calculated on admission and daily for ventilator dependent patients. Confounding variables were controlled by history, ultrasound and CT scan chest.

All findings were recorded according to thoracic trauma severity score and points were allotted accordingly. Recording was done on a *pro forma*. Zero (0) point was given to age <30 years, PaO₂/FiO₂ >400, no rib fracture, no lung contusion and no pleural involvement. One (1) point was given to age 30–41 years, PaO₂/FiO₂ >300–400, 1–3 rib fractures, lung contusion involving 1 lobe unilateral and pneumothorax. Two points were given to age 42–54 years, PaO₂/FiO₂ 200–300, 3–6 rib fractures, lung contusion involving 1 lobe bilateral or 2 lobes unilateral and unilateral hemopneumothorax or hemothorax. Three points were given to age 55–70 years, PaO₂/FiO₂ 150–200, >3 bilateral rib fractures, lung contusion involving <2 lobe bilateral and bilateral hemopneumothorax or hemothorax. Five points were given to age >70 years, PaO₂/FiO₂ <150, flail chest, lung contusion involving ≥2 lobe bilateral and tension pneumothorax. Grading was done on the basis of score by adding up all points. 0 score was assigned as grade 0, score 1–5 was assigned as grade I, 6–10 as grade-II, 11–15 as grade-III and 16–25 as grade-IV. Low TTS group included grades-0, I and II. High TTS group included grades-III, and IV. Details are shown in table-1.

Outcome was assessed by post trauma course of the patient. No post trauma complications were taken as normal outcome. Good outcome was taken for tenderness at the site of fracture ribs, hemothorax and pneumothorax managed with tube thoracostomy. Atelectasis, pneumonia, prolonged air leak, hemothorax requiring thoracotomy were taken as fair outcome. Poor outcomes were taken for all patients requiring ventilatory support, developing ventilation pneumonias and ARDS. Fatal outcome included death. Written and informed consent was taken from each patient. Permission was taken from ethical committee of the hospital.

RESULTS

A total of 264 patients were included in the study from March 2008 to February 2012 over a period of four years. The mean age of the patients was 44.8±17.1 years. There were 211 male and 53 female patients. The mean duration since injury was 12.2±11.7 hours and mean hospital stay was 11.07±7.4 days.

One hundred and fifty four (58%) of the patients were presented with isolated blunt chest trauma and 110 (42%) presented with poly trauma. Mortality for patients below 41 years of age was 22 (8%) whereas mortality for patients of 42 years and above was 49 (18.6%).

Chest radiograph of all blunt chest trauma patients was done; 63 (23.8%) patients were having <3 rib fractures, 100 (37.8%) of patients had 3–6 rib

fractures while >3 bilateral rib fractures were seen in 46 (17.4%) and flail chest was found in 55 (21%) cases. The analysis shows the statistically significant direct correlation between mortality and number of ribs fractured; in >3 bilateral rib fractures the mortality was 8.6% ($p=0.00$) and in flail chest it was 36% ($p=0.00$)

Lung contusion was assessed on chest radiograph and CT scan chest. No contusion was found in 103 (39%). Unilateral 1 lobe was involved in 56 (21%), bilateral 1 lobe in 56 (21%), <2 lobes bilateral in 21 (8%) while >2 lobes bilateral were contused in 28 (11%) of the blunt thoracic trauma patients. PaO₂/FiO₂ horovitz quotient of all patients was calculated. It ranged from 133 to 406. On admission PaO₂/FiO₂ ratio was <300 in 208 (78.8%) of cases with bilateral lung contusion. 189 (71.5%) of these cases required ventilatory support. In Unilateral lung contusion PaO₂/FiO₂ ratio was >400 in 9.6% and 300–400 in 47% of cases. Unilateral lung contusion had the mortality of 28 (10.6 %) and that of bilateral had been found to be 110 (41.6 %).

Pleural involvement was present in 233 (88.2%) of cases, 88 (33.3%) cases of blunt chest trauma presented with unilateral while 24 (9.1%) with bilateral pneumothorax. Unilateral hemothorax was present in 145 (55.5%) while bilateral was in 56 (21%) of cases.

The thoracic trauma severity score of the patients ranged from 1–23 with mean of 9.45. In grade-I, 25% patients, in grade-II, 35.6%, in grade-III, 24.2% and in grade-IV, 15.2% patients were present. There were 60% of patients in low TTS group and 40% in high TTS group.

Outcome was assessed as post trauma course of the patient, i.e., normal, good, fair, poor and fatal as depicted in figure-1. No complications were seen in 6.1% of cases. In 43.2% of cases tube thoracostomy was done for hemothorax and pneumothorax. Among the patients with fair outcome 7.6% presented with atelectasis, 16% had pneumonia and 1% required thoracotomy for hemothorax Poor outcome included patients who remained on ventilatory support, developed ventilation pneumonias and ARDS.

Outcome in low and high TTS group was compared using Chi square test. Low TTS group patients had normal, good and fair outcome whereas high TTS group cases mainly had, fair, poor and fatal outcome. Results showed statistically significant relationship ($p=0.000$) between patient's outcome and thoracic trauma severity score (TTS), details are shown in table-2; outcome of the patient worsened with increase in TTS.

Table-1: Thoracic trauma severity score

PaO ₂ /FiO ₂	Rib fracture	Contusion	Pleural involvement	Age (Y)	Points	Grade
>400	0	None	None	<30	0	0
300-400	1-3	1 lobe unilateral	Pneumothorax	30-41	1	I
200-300	3-6	1 lobe bilateral or 2 lobes unilateral	Unilateral hemothorax/hemopneumothorax	42-54	2	II
150-200	>3 Bilateral	<2 lobes bilateral	Bilateral hemothorax/hemopneumothorax	55-70	3	III
<150	Flail chest	≥2 lobes bilateral	Tension Pneumothorax	>70	5	IV

Table-2: Comparison between patient's outcome and thoracic trauma severity score (TTS) (n=264)

Comparison between patient's outcome & Thoracic trauma severity score(TTS)				
Patient's Outcome	Low TTS group	High TTS group	Total	p-value
Normal	16 (6.1%)	-	16 (6.1%)	0.03
Good	120 (45.4%)	8 (3.1%)	128 (48.5)	0.00
Fair	51 (19.3%)	9 (3.4%)	60 (22.7%)	0.00
Poor	-	34 (12.9%)	34 (12.9%)	0.01
Fatal	-	26 (9.8%)	26 (9.8%)	0.00
Total	187 (70.8%)	77 (29.2%)	264 (100%)	0.00

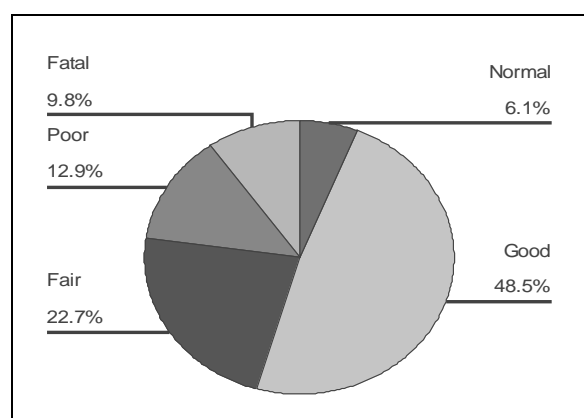


Figure-1: Outcomes in blunt thoracic trauma patients (n=264)

DISCUSSION

Thoracic trauma severity score (TTS) evaluates five different parameters (age, PaO₂/FiO₂, pulmonary contusion, rib fracture and pleural involvement).It is superior to all other described scores. The TTS offers a simple, reliable solution to the problem of early, CT independent judgment of the severity of thoracic trauma.¹

There is lack of diagnostic accuracy of chest trauma if only one of abovementioned parameters is used. This composite score helped overcome diagnostic inadequacies to quantify the full extent of pulmonary injury on admission of the patient and help in predicting the chest related complications early in the hospital course.¹¹

In the present study patients in the low TTS group had normal, good and fair outcome whereas those of high TTS group mainly had fair, poor and fatal outcome. It has been found that the majority of the cases in low TTS group had normal (6.1%) and good (45.4%) outcome. The 51 cases which had fair outcome had >3 ribs fractured and having lung contusion involving 2 lobes and pleural involvement.

As mentioned earlier in discussion these parameters have adverse effect in outcome of the patients with blunt thoracic trauma. These cases developed atelectasis and pneumonia in their post trauma course.

In the current study it has been observed that most of the patients in high TTS group had fair, poor and fatal outcome. They had unilateral or no lung contusion and having unilateral pleural involvement. This resulted in their better post trauma outcome.

Outcome of the patient worsen with increase in thoracic trauma severity score (TTS). On admission TTS assessment helped to determine the post trauma chest related complications in these cases. This helped in improving the management strategies in these cases. Farooq U⁷ and Hanif F¹² in their prospective study have mentioned that timely assessment of severity of chest trauma and adequacy of treatment strategies helped in reducing various complications.

CONCLUSION

Thoracic trauma severity score (TTS) is standardized scoring system for appraisal of early evaluation of severity of chest trauma by evaluating five different parameters (age, PaO₂/FiO₂, pulmonary contusion, rib fracture and pleural involvement).

Increase in thoracic trauma severity score (TTS) signifies the severity of trauma and outcome of the patient worsen accordingly

REFERENCES

- Hildebrand F, Griensven MV, Garapati R, Krettek C, Pape HC. Diagnostics and Scoring in Blunt Chest Trauma. Eur J Trauma 2002;28:157-67.
- Basoglu A, Akdag AO, Celik B, Demircan S. Thoracic trauma: an analysis of 521 patients. Ulus Travma Acil Cerrahi Derg 2004;10:42-6.
- Esme H, Solak O, Yurumez Y, Yavuz Y. The factors affecting the morbidity and mortality in chest trauma.Ulus Travma Acil Cerrahi Derg 2009;12:305-10.

4. Le Pimpec-Barthes F, Berna P, Hernigou A. Evaluation of the severity, and search of early complications in thoracic trauma. *Rev Prat* 2007;57:551–60.
 5. Esme H, Solak O, Yurumez Y, Yavuz Y, Terzi Y, Sezer M, *et al.* The prognostic importance of trauma scoring systems for blunt thoracic trauma. *Thorac Cardiovasc Surg* 2007;55(3):190–5.
 6. Liman ST, Kuzucu A, Tastepe AI, Ulasan GN, Topcu S. Chest injury due to blunt trauma. *Eur J Cardiothorac Surg* 2003;23:374–8.
 7. Farooq U, Raza W, Zia N, Hanif M, Khan MM. Classification and management of chest trauma. *J Coll Physicians Surg Pak* 2006;16:101–3.
 8. Wang SH, Wei TS, Chen CP. Prognostic analysis of patients with blunt chest trauma admitted to an intensive care unit. *J Formos Med Assoc* 2007;106(6):444–51.
 9. Meade Barlow, Jose M. Prince. Predicting outcomes in the setting of the blunt thoracic trauma. *J Surg Res* 2013;183(1):100–1.
 10. Mommsen P, Zeckey C, Andruszkow H, Weidemann J, Frömke C, Puljic P, van Griensven M, *et al.* Comparison of different thoracic trauma scoring systems in regards to prediction of post-traumatic complications and outcome in blunt chest trauma. *J Surg Res* 2012;176(1):239–47
 11. Pape HC, Remmers D, Rice J, Ebisch M, Krettek C, Tscherne H. Appraisal of early evaluation of blunt chest trauma: development of a standardized scoring system for initial clinical decision making. *J Trauma* 2008;49(3):496–504.
 12. Hanif F, Mirza SM, Chaudhry A M. Reappraisal of Thoracic Trauma. *Pak J Surg* 2000;16(3):25–8.
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