ORIGINAL PROF-955

POLYTRAUMA
EPIDEMIOLOGY & PROGNOSIS VERSUS TRAUMA SCORE

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ABSTRACT ... surgazhar@yahoo.com **Objective:** To study the epidemiology of trauma and prognostic significance of various trauma score systems. **Design:** A multi-center descriptive study **Place and duration of study:** The study was conducted from July 1995 to March 2005 comprising almost 10 years in services hospitals of Lahore, Malir, Sialkot, and Mianwali. **Patients and Methods:** 271 patients of various age groups were studied. Cases were grouped as burns, head injuries and multisystem injuries and were managed according to Advance Trauma Life Support (ALTS) and parameters of various trauma scores recorded and compared with outcome. **Results:** Probability of survival as calculated by TRISS methodology has better prognostic significance than various trauma score systems alone. The study revealed low specificity in all types of injuries showing late deaths and unexpected complications. Revised Trauma Score and TRISS methodology were more accurate in multiple injuries than in burn and head injuries. **Conclusion:** Revised Trauma Score (RTS) is useful tool as triage and prognostic indicator for multiple injuries but not in cases of burns and head injuries. We need to develop our own norms and coefficients for TRISS methodology and unexpected outcome should be minimized by sound clinical judgment. Moreover, we need radical improvement in burn care and neuro-surgical facilities in our country

Key Words: Trauma scores, Revised Trauma Score, Poly-trauma patient, Trauma.

INTRODUCTION

Trauma is the third most common cause of death overall[1]. It is the leading cause of mortality, morbidity and disability during the prime of life. The direct cost to society is enormous and in developed countries it has been estimated in hundreds of millions of dollars per day. In our country this problem is further compounded by meager health and rehabilitation facilities.

The wish to catalogue injuries and outcomes is as old as human record keeping[2]. In recent era various trauma-scoring systems have been evolved. Trauma Score (TS) or Champion-Sacco-Score is based on blood pressure, respiratory rate, respiratory effort, capillary refill and Glasgow Coma Score (GCS). It ranges from zero to 16. Revised Trauma Score for outcome evaluation is more accurate and is the Weighted Sum of coded values of GCS, Systolic Blood Pressure (SBP) and Respiratory Rate (RR) and ranges from zero to 7.84. The Injury Severity Score (ISS) classifies an injury on the basis of confirmed anatomic diagnosis and is derived from The Abbreviated Injury Scale (AIS). Despite its direct relationship with outcome, ISS, when calculated without autopsy, results in under-estimation of severity of injury[3].

Calculation of Probability of Survival (PS) helps to separate injured patients who are destined to live from those who are going to die. Revised Trauma Score, Injury Severity Score and patients' age are used in TRISS methodology for the calculation of Probability of Survival. Sensitivity is the percentage of non-survivors with PS values less than 0.5 and Specificity is the percentage of survivors with PS exceeding 0.5. Mis-classifications are survivors with PS<0.5 or non-survivors with PS>0.5.The CRAM Scale is a physiologic scoring system and assigns a numerical value to the state of circulation, respiration, abdomen and chest, motor function and speech. The value ranges from zero to 10.

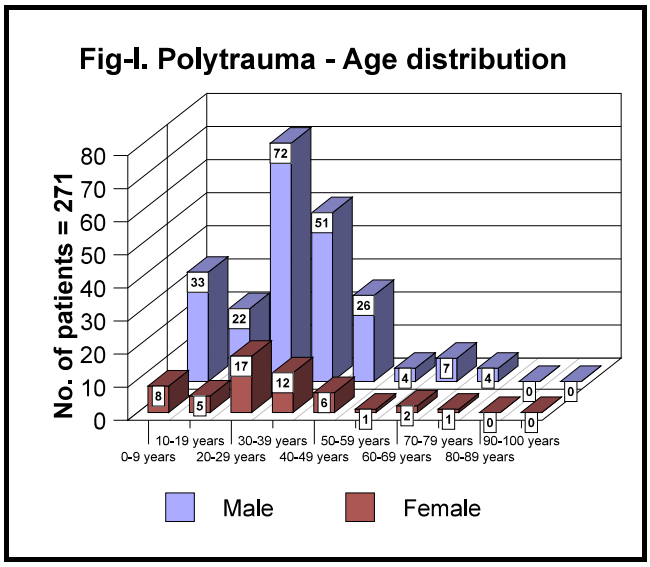
PATIENTS AND METHODS

This study encompasses various trauma cases and their epidemiology based on age, sex and details of injuries sustained. Major burns, head injury alone or in combination with other injuries, two or more than two long bone fractures or an unstable fracture or a fracture dislocation of a major long bone, the pelvis or spine, penetrating or non-penetrating injury abdomen with signs of intra-abdominal bleeding with or without other injuries, blunt or penetrating injury chest, axilla, groin, with massive bleeding, and trauma sustained in pregnancy were included in this study.

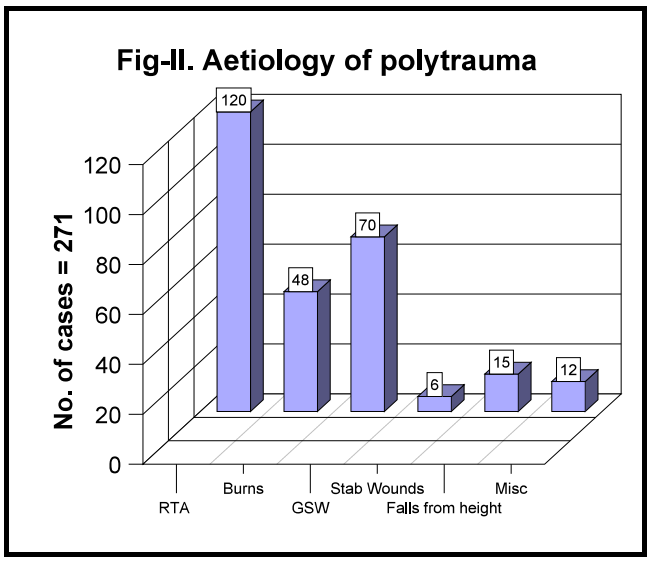
All these patients were divided into three groups. Group I consisted of burn cases, group II consisted of isolated head injuries and group III consisted of all other polytrauma cases excluding those in group I and group II. An account was kept of all such cases and their findings were recorded. The patients thus received were initially examined and resuscitated according to Advanced Trauma Life Support (ATLS) program. They were assigned scores according to Injury Severity Score, Trauma Score, Revised Trauma Score, and modified CRAMS Score. Probability of Survival was calculated by TRISS methodology. Prognosis of all these cases was compared with trauma score and probability of survival calculated at the time of admission.

RESULTS

Total number of polytrauma cases, which were admitted in three different hospitals from July 1995 to March 2005, is 271. Out of them 219 (80.81%) were male and 52(19.18 %) were female. Average age of patients was 30.74 years. The minimum age was 2 years and maximum age was 75 years (Fig-I).



The average age of male patients was 32.5 years while that of female patients was 28.2 years. Aetiology was variable (Fig.2), average evacuation time was slightly more than one hour (70 minutes) and the overall mortality was 35.05 %.



48 patients (17.71%) were admitted due to burns alone.

Out of these 48 patients 20 patients (41.6%) were male and 28 patients (58.33 %) were female. Average age of burn patients was 24.6 years. Average burn percentage was 57.7%. Average time taken for evacuation was 2.8 hours. Mortality was zero percent for burns upto 30%, it increased to 40 % with 35% burns and 80% with 55% burns. Mortality became 100% with 75% burns and above. Overall mortality was 66.67 %. Commonest causes of death were septicemia and respiratory complications due to inhalation injury. Average stay in hospital was 6.5 days in death cases. In group I Trauma Score, Revised Trauma Score and modified CRAMS score weakly separated survivors from non-survivors. Average PS as calculated by TRISS methodology was 0.69 for survivors and 0.58 for non-survivors. Disparity 'D' and misclassifications were significantly low as compared with TS, RTS, & modified CRAMS score (Table-I).

There were 114(42.07%) head injury cases. Out them 50 patients were admitted due to head injury alone and were placed in group II. Another 64 patients were admitted with combination of head injury and various other injuries including fractures, chest or abdominal injuries. Out of these 114 head injuries, 63 were blunt and 51 were penetrating (mostly due to GSW and road traffic accidents). 64 patients (56.14%) were males while 50 patients (43.86 %) were females. Average age was 24 years. Average evacuation time in cases of head injury was 55 minutes. There was 40% mortality in cases of head injury alone while it was 61 % when head injury was combined with other visceral injuries. In group II Glasgow Coma Scale was 10.2 in survivors and 5.0 in non-survivors (Table-II). Probability of survival as calculated by TRISS methodology was 0.57 and 0.25 for survivors and non-survivors respectively.

Table I. Result of different scoring systems in burns.
Sample size = 48, Survivors = 16, Non Survivors = 32, Mortality = 66.67%

Average Score	Burn	I.S.S.	T.S.	R.T.S.	Modified crams score	Prob. Of survival
Survivors	40.00	22.35	14.00	7.82	10	0.69
Non-Survivors	69.00	41.50	15.00	7.54	8.75	0.58
Disparity 'D'	69.00	19.15	1.00	0.28	1.25	.11
Sensitivity %	85.00	99	94.00	96	80	0.1
Specificity %	59.05	40	33.33	33.33	33.33	0.57
Mis-classification	13	2.00	16.00	16	20	-

Table II. Result of different scoring systems in isolated head injuries.
Sample size = 50, Survivors = 30, Non Survivors = 20, Mortality = 40%

Average Score	G.C.S	I.S.S.	T.S.	R.T.S.	Modified crams score	Prob. Of survival
Survivors	10.2	19	14.50	7.02	8.57	0.57
Non-Survivors	5.00	31.5	10.00	5.10	6	0.25
Disparity 'D'	5.20	12.5	4.50	1.92	2.57	0.32
Sensitivity %	75%	75%	100%	100%	100%	80%
Specificity %	80%	66.67%	70%	70%	70%	68%
Mis-classification	7	12	11	10	10	-

Third group of patients comprised of all other polytrauma cases excluding those who sustained burn or head injuries alone (Table-III). As already mentioned 64 patients (23.61%) sustained head injuries in combination with various other injuries. Out of them 39 patients died. The mortality rate was (61%). The most lethal combination was head injuries with multiple fractures. In group III average RTS was 7.0 and 5.0 in survivors and non-survivors respectively (Table IV). Average PS was 0.74 for survivors and 0.40 for non-survivors. Mis-classifications were the lowest. Unexpected deaths were mostly due to late complications like sepsis and DVT and intestinal and pancreatic fistulas.

DISCUSSION

There is male predominance in working class so they are more exposed to trauma hazards. Moreover, predominant involvement of younger age group reveals increased susceptibility of our youth to trauma hazards. In western countries more females are exposed to trauma deaths[4].

The overall mortality of 35.05 % mainly comprises of burns (mortality 66.67%), isolated head injury (mortality 40 %) and head injury along with associated injuries (mortality 61%). In developed countries the outcome is much better[5] than underdeveloped countries[6]. Overall average evacuation time was slightly more than one hour (65 minutes). This is very encouraging but does not reflect the same in rural areas with primitive communication and health facilities. The standard evacuation time in the United States is 31 minutes. In Germany it was found to be 34 minutes[7].

Table III. Breakdown of Injuries

Type	Numbers	Mortality
Burns	48	66.67%
Head injuries alone	50	40%
Head injury combined with other injuries	64	61%
Abdominal injury alone	14	Nil
Abdominal injury combined with other injuries	41	18.18%
Fractures combined with other injuries	95	16.84%
Vascular injuries	10	20%
Trauma in pregnancy	10	10%

Table IV. Result of different scoring systems in multiple injuries (Excluding burns and isolated head injuries). Sample size = 173, Survivors = 128, Non Survivors = 45, Mortality = 26.01%

Average Score	I.S.S.	T.S.	R.T.S.	Modified crams score	Prob. Of survival
Survivors	23.00	15.00	7.00	8.75	0.74
Non-Survivors	30.50	10.50	5.00	6.25	0.40
Disparity 'D'	7.50	4.50	2.00	2.50	0.34
Sensitivity %	49.50%	98.50%	98%	90%	58.16%
Specificity %	78.50%	85%	85%	82%	84.61%
Mis-classification	24	14	8	12	-

In burns, ISS showed 99% sensitivity. This was due to the fact that most of the burn patients sustained 40% - 100% burns with inhalational injuries. According to Abbreviated Injuries Scale 40 - 89% burns are given AIS 5 and more than 90% burns are given AIS 6 (fatal). Their ISS scoring was sensitive enough to pick up potentially fatal cases. However, 40% specificity reveals delayed deaths due to infections and other complications of burns. TS, RTS and CRAMS score failed to indicate dying cases because there was no change in vital signs

in initial recording. Moreover, low specificity of TS, RTS and CRAMS score is again due to late complications and deaths. These results confirm the results obtained by other studies[8]. Probability of survival as calculated by TRISS methodology was a better predictor than other systems but still showing low specificity. These findings emphasize the dynamic nature of T.S and RTS and warrant repeated recordings to detect up-hill or downhill courses. Moreover, delayed complications like renal failure and infection that are so common in burn cases are not covered in these scoring systems. This prediction failure resulted in significant mis-classifications.

Mortality in isolated head injury was 40 % while it was 61% when head injury was associated with other injuries. Increased mortality in later group is due to the fact that severe head injuries become the main limiting factor for the prognosis of poly-traumatized patients[9]

Glasgow Coma Scale is fairly sensitive and specific for head injury cases. ISS has under-estimated head injury cases. Moreover, in the absence of CT scan, MRI or operative/autopsy findings proper recording of ISS is not possible. When physiological paramaters like blood pressure, pulse or respiration are affected the injury is usually very serious and sensitivity of RTS, TS and CRAMS scale is very accurate. Specificity is low due to lack of proper neurosurgical facilities in our set up. Calculation of probability of survival gives better predictive value.

Various combinations of multiple injuries were encountered in this study. The most lethal combination was head injury with multiple fractures. In multiple injuries Revised Trauma Score revealed the best prediction. The sensitivity of TS and RTS is comparable to many other studies[10]. As these systems are physiologic parameters of severity of injury any gross derangement of these vital functions is instantaneously reflected by TS, RTS and CRAMS scores.

Therefore, potentially fatal cases are easily picked up. ISS is anatomic severity scoring so at times it is unpredictable and outcome of patient depends upon many other factors like, age, preexisting conditions (Diabetes mellitus, Hypertension, COPD, Ischaemic Heart Disease, etc). Keeping in view these limitations a new term TRISS COM has been introduced by adding co-morbidity factors thus improving outcome prediction[11]. TRISS methodology is still very useful in calculation of probability of survival.

In present study sensitivity and specificity is increased from 49.67% and 78.53% in ISS to 58.16% and 84.61% respectively in PS. However, the percentage of misclassification in this study and many other studies in developed countries[12] is quite high which reflects either treatment failure or triage failure and is expected to improve with better treatment facilities and more experience in trauma evaluation. Specificity is more than 90% in TRISS methodology in majority of studies conducted in developed countries[13] and significantly low in many underdeveloped countries with poor medical facilities[14].

RTS is rapid method of evaluating trauma outcome in emergency. Its predictive value can be further improved by recalculations at frequent intervals and by use of TRISS methodology.

However, one should be very careful in interpreting the results and scoring systems for outcome prediction should be utilized only as an adjunct to clinical assessment for evaluating severity of injury.

The developed countries have established national norms for trauma care. The efficiency of any hospital or surgical unit can be compared by studying their trauma cases and plotting the probability of survival using TRISS regression coefficients against ISS. Then unexpected outcomes are critically analyzed and any deficiency is improved. In our country there are no such norms.

Suggestions

We need a radical change and improvement in present trauma care system in Pakistan.

Accident and emergency services should be improved in our hospitals.

Doctors and paramedical staff should be trained in

Advance Trauma and Life Support principles.

Further studies on larger scale are required to establish national norms of trauma care in our country.

CONCLUSION

Revised Trauma Score is quite helpful for triage in multiple injuries, but it has poor predictive value in burns. It should be used cautiously and only as an adjunct to clinical assessment and not as sole parameters for decision-making.

The scoring systems including TS, RTS and CRAMS score are dynamic indices and their values change from time to time depending upon the efficiency of resuscitation and appearance of new complications.

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