

Incidence of Missed Injuries in a Polytrauma Patient Intertertiary Care

Abhishek Gupta¹, Siddhant Shrotriya², Mrunal N. Ketkar³, Shilpa S Patankar⁴

¹Junior Resident, Bharati Vidyapeeth Medical College
abhi4195[at]gmail.com

²Senior Resident, Bharati Vidyapeeth Medical College
siddhant.shrotriya[at]yahoo.com

Professor and HOU, Bharati Vidyapeeth Medical College
mrunalnitin[at]gmail.com

⁴Professor, Bharati Vidyapeeth Medical College
drshilpa2000[at]gmail.com

Abstract: Polytraumas are a leading cause of death and hospitalization especially in the young adults. Most of the times during the initial survey in emergency some major or minor injuries get overlooked leading to a great impact on the patient be it prolonged hospitalization, longer intensive care unit stay and sometimes an unworthy death. Missed injuries have a bad reputation and are sometimes associated with serious morbidity for the patient and personal embarrassment for the surgeon. Patients with missed injuries had higher mean Injury Severity Scores and longer stays in hospital and intensive care unit compared with patients without missed injuries.

Keywords: Missed Injuries, Polytrauma, Survey, Diagnosis

1. Introduction

Polytrauma is a common cause of death in young adults. The term polytrauma has been frequently defined in terms of a high Injury severity scores (ISS) and has been generally used interchangeably with term such as severely injured or multiple traumas. (1)

Missed Injuries (2)

- An injury that is undiagnosed in the emergency department during primary and secondary survey but are recognized in subsequent admission.
- Injury identified after the admission in intensive care unit.
- Injuries that are found after the complete assessment and diagnostics, and are directly related to the injury.
- Injuries that were missed within 6 to 12 hours.

Classification–

Type-1 – those which escape the initial physical examination and screening investigations.(i.e., escape through primary, secondary and emergency intervention but detected within 24hrs and before trauma tertiary survey)

Type 2 – which escape the directed diagnostic evaluation (injury missed at initial assessment and tertiary trauma score)

Type 3 – where a diagnostic workup is curtailed in favor of immediate life saving intervention. (Injury missed at initial assessment, tertiary trauma survey and hospital stays). (2)

These injuries could involve any of the system of the body. But the most common one is the musculoskeletal system i.e., around 54% Second most common being peripheral nerve injury i.e., in 14.3 percent cases and the last but one of the

most dangerous one the central nervous system in 9.5% cases.

This study was conducted to improvise the active primary survey in the emergency so that missed injuries in the polytrauma patients can be diagnosed and treated early. In the process we will be introducing a proforma as “TRAUMA CLERKING SHEET” that would have all the systems to be examined in it. Hence making it a protocol to be followed in the emergency if the incidence reduces after the amendment of our proforma.

Literary Survey: Polytrauma is a leading cause of morbidity and mortality in developing as well as developed countries. “Polytrauma” a term widely used to define trauma that involves multiple body region/cavity that causes dysfunction of the organ and compromises body physiology.

Or

A trauma involving 2 or more body systems.(1)

These patients are at high risk of mortality and morbidity. But can be saved if given priority and efficient specialist care, and require aggressive resuscitation, transfusion and multiple sequential operations. There are multiple number of scoring systems which are used in trauma cases to predict the severity of injury so as to predict the condition and further management of the patient.

Trauma scenario in India –

In India the most common cause of polytrauma is Road Traffic Accidents.

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According to “The Academy of Traumatology” (2002) which undertook a study on trauma system that revealed serious and striking deficiencies in the system. It signified that from India’s current 9th position globally in deaths due to trauma the rank would rise to 3rd by the year 2020.(3)

Anatomical

- 1) Abbreviation injury scale (AIS)
- 2) Injury severity score (ISS)
- 3) New injury severity score (NISS)
- 4) Organ injury scale (OIS)
- 5) Anatomical profile
- 6) International classification of disease injury severity (ICISS)

Physiological

- 1) Revised Trauma score
- 2) Glasgow coma scale
- 3) APACHE –scoring (APACHE I, II, III)

However, out of all the studies TRISS had the max predictive value (R value) of 0.90.(4)

Trauma Protocols-

Historically, protocols for trauma developed first in the year 1976 by Dr. Styner and his colleagues from Lincoln, they developed a strategic and standard protocol for management of trauma patients and also gave the concept of “golden hour” in trauma.

This protocol was presented to the American College of Surgeons in a few years and was accepted in the same year. Since then the protocol has been practiced worldwide and has been known to have saved many lives globally and used for pilot training across the countries. A protocol that will define the necessary examination must be put in practice so as to reduce the incidents, morbidity, and mortality. Even though this is not a new topic, but very few studies have been conducted to explain the problems.

The management of polytrauma patients can be challenging even to the most experienced surgeons. Injuries tend to miss even after a thorough examination. Strict priorities to initial assessment have been dictated by the advanced trauma life support(5).

In 1978 *Advanced Trauma Life Support* course was introduced for the first time, and currently is being followed in over 60 countries. It is hence the gold standard in managing the polytrauma patients in emergency. It comprises of didactic information, procedural skills, culminating with management of trauma patients. Effectiveness of this protocol can be seen by reduced mortality and morbidity in such patients.(6)

Missed Injuries:

- An injury that is undiagnosed in the emergency department during primary and secondary survey but are recognised in subsequent admission.
- Injury identified after the admission in intensive care unit.
- Injuries that are found after the complete assessment and diagnostics, and are directly related to the injury.
- Injuries that were missed within 6 to 12 hours.(7)

Classification:

- Type 1: those which escape the initial physical examination and screening investigations. (i.e., escape through primary, secondary and emergency intervention but detected within 24hrs and before trauma tertiary survey).
- Type 2: which escape the directed diagnostic evaluation (injury missed at initial assessment and Tertiary Trauma Survey).
- Type 3: where a diagnostic workup is curtailed in favor of immediate life saving intervention. (injury missed at initial assessment, Tertiary trauma Survey and hospital stay).(2)

Pfeifer et al (7), in the year 2006 did a review of literature based on several studies where he had studied the different results regarding the cause and outcome of missed injuries in a polytrauma case where he has defined missed injuries as

- a) Injuries not identified on primary and secondary survey’s but on the tertiary survey.
- b) Injuries identified during ICU admission within 24 hours.
- c) Injuries that were missed in the in initial 6 to 12 hours.
- d) Injuries that were found after complete assessment and diagnostics and were directly related to the primary injuries.

He has also classified them as clinically significant missed injuries

- a) Missed injuries associated with high morbidity and mortality.
- b) Missed injuries that were associated with significant pain, complications and residual disability and mortality.
- c) Missed injuries that were associated with alteration in the ongoing therapy.

According to literature the incidence of missed injuries were 1.3% to 39% whereas the incidence of significant missed injuries was in the range of 15% to 22.3%. (7).

Stanescu et al(8), in 2008 stated that diagnostic error in radiological field in polytrauma patients is very common the range varies from 2% to 40% which are mostly common in the spine and per-articular region of the body. Especially in a hemodynamically unstable patients who initially require an urgent resuscitation and surgery.

The prime reason as stated in this article which lead to overlooked injuries were-

- 1) Misleading history.
- 2) Distracting clinical as well as radiological findings.
- 3) Misjudgment of the injuries.

Studies suggest that autopsies have reported as much as 34% missed injuries in polytrauma cases. Several factors, both patient and doctor related, have been identified in earlier studies that led to increased likelihood of unrecognized injuries. (9)

These injuries could involve any of the system of the body. But the most common one is the musculoskeletal system i.e, around 54% Second most common being peripheral nerve injury i.e, in 14.3% cases and the last but one of the most

dangerous one the central nervous system in 9.5% cases (10).

Missed injuries have been a prime potential source of increased morbidity and mortality that also represents a broad range of clinical inexperience. Apart from inexperience, the second reason turns out to be lack of studies on this topic that accounts for these errors.

To decrease the incidence of missed injuries in such cases where rapid initial assessment is devoted to identify life threatening conditions immediately followed by a detailed secondary survey that includes head to toe examination which is mandatory to decrease such incidents. Ultimately, a tertiary survey which was first introduced by Enderson et al (11) that was dedicated to the injuries that have been missed even after primary and secondary survey.

Nowadays, the tertiary trauma survey is more commonly practiced, certain trauma units have even created protocols for it to reduce the incidence of missed injuries in polytrauma patients. A standardized TERTIARY TRAUMA SURVEY protocol has proven to reduce the incidence of missed injuries. Despite these efforts, some injuries can still be left behind (12).

However, some studies have been conducted in the field of orthopedics, or in subpopulation (13–15) but extensive studies are very few (12,16–18).

2. Material and Method

Study Area: Bharati Hospital, tertiary care hospital with 840 beds and Research Center. Labs are NABL and hospital is NABH accredited.

Study Design: All patients of polytrauma presenting to the emergency department for treatment will be included in this study. The study will be conducted in the period of July 2018 to July 2020.

Study Population: All polytrauma patients.

Period of Study: 2 years

Inclusion Criteria: All patients coming to the casualty with primary polytrauma to be included in the study.

Exclusion Criteria: All patients who have been treated outside initially.

Methodology

Considering the inclusion and exclusion criteria patients will be selected, will be informed and explained about the study in the language they understand data will be collected and entered in a specially designed proforma. Consisting of –

1. Patient details
2. History
3. Clinical examination
4. Investigations
5. Diagnosis
6. Initial diagnosis v/s final diagnosis
7. Discharge details and condition on discharge.

3. Procedure

Protocol formed -> initial assessment would be done on the basis of the existing protocol and also by the new proforma -> comparison of normal/regular assessment vs protocol assessment -> data stored -> result and application of protocol.

(Comparison between old vs new only theoretical. All the standard care would be given which is not the part of the study.)

Data Analysis

The collected data will be coded and entered in microsoft excel sheet. The data will be analyzed using spss (statistical package for social sciences) version 20.0 software. The results will be presented in tabular and graphic format. For quality data various rates, ratios and percentage will be calculated. For quantitative data mean, standard deviation, median etc. will be calculated. If applicable : (for qualitative data test like chi-square test and for quantitative data t-test /anova will be used for comparison of variables) A two tailed test with p value <0.05 will be considered as significant.

This will include –

- Demographic profile
- Etiological profile
- Analysis of missed injuries
- Calculation of the incidence per 100 patients

Results: The study was carried out on total 100 patients of polytrauma over the duration of two years. Polytrauma patients were first assessed with the current existing protocol and were re assessed with the proforma that has been proposed by us. All the injuries that were missed during the primary and secondary survey and were diagnosed subsequently in the tertiary survey were noted. The aim of this study was to know the incidence of missed injuries in a tertiary care.

The objectives for this study were to identify the gaps in the current evaluation and my proposal. Implement the new proposal for tertiary survey.

- 100 patients of polytrauma were studied.
- Out of the 100 patients maximum were in the age group of 20-29 that is, 35%.
- Most of the patients with polytrauma were males that is, 87%.
- Out of the 100 polytrauma patients the most common mode of injury was Roadtraffic accidents.
- The most common system involved was central nervous system.
- The incidence of missed injuries was 8%
- Most of the patient who had missed injury presented with a low GCS score.
- The most common system with missed injuries was musculoskeletal system.
- The most common missed injury was rib and scapula fracture.
- The most common age group with missed injury was 40-49.

Most of these missed injuries were minor injuries. That did not cause any threat to life but they did increase the morbidity of the patient.

4. Discussion

Polytrauma is a leading cause of morbidity and mortality in developing as well as developed countries. Advanced trauma life support and other scoring systems have simplified the approach to a polytrauma case but still, the incidences of missed injury remain unchanged and overlooked. In India the rate of polytrauma and missed injuries have signified a striking deficiency in the system, India has been ranked ninth globally in polytrauma cases and is expected to rise to a sky high third position in the coming years. Tertiary survey which has been widely practiced in certain surgical units nowadays has helped to decrease the incidence of missed injuries that were overlooked during the primary and secondary survey. That includes radiological based approach ones the patient has been stabilized.

In this study 100 patients were studied using the current protocol and with later with the Proforma that we have introduced. The aim of this study is to compare the overall causes, outcomes and distribution of the types of injuries that are missed during the primary and secondary survey that are detected in tertiary survey.

Our review demonstrates the following main findings:

Incidence of Missed injuries – In our study of 100 patients 8 had missed injury and 92 did not have missed injury in the study group.

Missed injuries which have got an incidence of 1.3% to as high as 39%. In our study conducted on 100 patients we diagnosed 8% patients with missed injuries. Which were diagnosed during tertiary survey.

Age distribution of cases

Of 15 cases with age less than 20 years, 1 (6.7%) had missed injury and 14 (93.3%) did not have it. Of 35 cases with age between 20 – 29 years, 2 (5.7%) had missed injury and 33 (94.3%) did not have it. Of 27 cases with age between 30 – 39 years, 3 (11.1%) had missed injury and 24 (88.9%) did not have it. Of 7 cases with age between 40 – 49 years, 2 (28.6%) had missed injury and 5 (71.4%) did not have it. Of 50 cases with age above 50 years, none had missed injury.

Distribution of prevalence of missed injury did not differ significantly across various age groups of cases studied in the study group (P-value>0.05).

Fitschen et al in 2019(43), studied 34,000 patients where max. patients were in the age group of 18-59 years i.e, 73.2%.

Houshian et al in 2002(24), studied 786 patients with maximum patients in 13-81 years age group median being 33 years.

Even though the most common age group for polytrauma was 20-29 the most common age group for missed injuries was 40-49.

1) Mode of injury

In our study of 100 patients, 72 had road traffic accident, 22 had fall from height and 6 had assault in the study group. Fitschen et al (43) in 2019, conducted a study that suggested that road traffic accidents are the most common cause of polytrauma.

Even though, road traffic accident is the most common cause of polytrauma, but injuries are more commonly missed in cases of fall from height. It is the mechanism of injury that can be sometimes predicted in road traffic accidents which in fall from height cases becomes unpredictable, hence it becomes a early predictor for missed injuries and tertiary trauma survey must be a done in such cases.

2) Missed injuries and low GCS

Of 100 cases studied, 38 had GCS score between 3–8, 33 had GCS score between 9 – 12 and 29 had GCS score between 13 – 15 in the study group. In our study 38% of the patients with missed injuries had GCS between 3-8.

Houshian et al (24) in 2002, conducted a study and suggested that around 36.2% of missed injuries were seen in the patient with low GCS.

Low GCS is an early predictor and a common cause of high rates of missed injuries one should always think of it as a possibility of this entity.

3) Ultrasonography as a radiological modality in polytrauma- Of 100 cases studied, 60 had normal USG findings and 40 had abnormal findings on USG in the study group.

Miele et al (44), conducted a study in 2014, which suggested that The FAST scan should be the first level of investigation in finding effusions in clinically unstable patients who require a urgent treatment and cannot be moved for CT scan, it is known from literature it has very high values of sensibility and specificity in the detection of hemoperitoneum approx. 97–100 %. 40% patients in our study had a positive finding in early emergency ultrasonography.

As per the literature E-FAST plays a vital role in diagnosing life threatening abdominal injuries early. Thus, reducing the mortality and morbidity.

4) Percentage of clinically significant missed injuries analysing all patients with missed injuries

Even though our study diagnosed 8% missed injuries but none of them was life threatening. But, as high as 20% of the injuries missed were clinically significant

As, per the literature the incidence of missed injuries can vary from 1.3 to 39%, but majority of them had no impact on mortality. But some of them had a significant impact on the morbidity of the patient.

The application of a protocol for tertiary survey has proved to be easy, inexpensive and beneficial to patients particularly in polytrauma patients because it enabled identification of important injuries that were not detected on admission in a large group of patients. Highly unstable patients particularly brain injury and those undergoing emergency surgical procedure appear to be at highest risk for Missed injuries.

In our study we found that Low GCS, high ISS and positive E-FAST findings were the most commonly associated factors with missed injuries.

Implementation of a standardized Tertiary survey decreases Missed injuries by 36% at a Level I trauma center, and more timely Tertiary survey would likely have further reduced Missed injuries. A Tertiary Survey should be a routine in trauma centers. (44)

According to literature systematic review found empirical evidence that timely Tertiary Trauma Survey improves trauma care by increasing Type I missed injuries and reducing Type II missed injuries.(2)

In polytrauma patients, most missed injuries were diagnosed during hospital admission but after tertiary survey. This signifies that the tertiary survey should be an ongoing process and must be repeated daily in polytrauma patients. Most frequent DDI were extremity injuries. (29)

Missed injury in the context of polytrauma remains a persistent problem, both as clinical or medico legal point of view. Estimates of incidence vary widely and dependent on the precise parameters of the studied population, the definition of missed injury and the extent of follow-up, but may be as high as 38%.

The tertiary survey, in which formal repeated examination of the patient is undertaken after initial resuscitation and treatment have taken place, has been suggested as a way of identifying injuries not found at presentation.

Our study appraises the concept of the tertiary survey, and also reviews the literature on missed injury in order to identify the risk factors, reasons for errors and the types of injury.

Conclusion

This study was conducted to know the incidence of missed injuries in a polytrauma case in a tertiary care.

- The overall incidence of missed injuries was 8%.
- Musculoskeletal system was the commonest system involved.
- Most common injuries missed were rib and scapula fracture.
- The commonest modality was Road traffic accident.
- Low GCS, high ISS and positive E-FAST findings were the most commonly found factor for the missed injuries.

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Author Profile

Abhishek Gupta, Junior Resident, Surgery Department, Bharati Vidyapeeth Medical College, Pune.

Siddhant Shrotriya, Senior Resident, Surgery Department, Bharati Vidyapeeth Medical College, Pune.

Mrunal N. Ketkar, Professor and HOU, Surgery Department, Bharati Vidyapeeth Medical College, Pune.

Shilpa S Patankar, Professor, Surgery Department, Bharati Vidyapeeth Medical College, Pune.