

## Missed orthopaedic injuries in trauma patients at a rural tertiary trauma centre

Madhukar KT<sup>1,\*</sup>, Harsh Tiwari<sup>2</sup>, Cheemala Vikram<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>2,3</sup>Junior Resident, Dept. of Orthopaedics, AIMS, BG Nagar

**\*Corresponding Author:**

Email: drmadhukarkt@gmail.com

### Abstract

Missed injuries is defined as an injury found after the initial complete patient assessment and diagnostic studies that was directly related to the traumatic event and was identified after first 24 hours following admission. Even though not frequently life-threatening, they may result in significant long-term disability. The aim of this study was to define the incidence of missed orthopaedic injury for adult major trauma patients and to examine the details of missed injuries in order to identify and make comment on potential risk factors for missed injury. 671 admissions in orthopaedics indoor patients in a rural tertiary care centre for the period of 10 months from 1st January 2016 to 31st October 2016 were included for study. 18 patients were identified with delayed diagnoses of the injury. Patients with a decreased level of consciousness or head injury, with intubation/sedation or with alcohol or drug intoxication are unable to give a good history, cooperate with physical exam or identify sources of pain are the main risk factors for missed injuries. Other factors for missing an injury include Inadequate Clinical Assessment, Misinterpretation of Studies and Late Presentation of Observable Findings. Repeated assessments, both clinical and radiological, are mandatory to diminish this problem. In initial evaluation, one still has to treat the greatest threat to life before complete diagnosis of all injuries, but alertness to evolving injuries must remain in mind throughout the patient's hospital stay.

**Keywords:** Missed Injury, Orthopaedics, Adults

### Introduction

Missed injuries is defined as an injury found after the initial complete patient assessment and diagnostic studies that was directly related to the traumatic event and was identified after first 24 hours following admission. A clinically significant missed injury was defined as an injury in which delayed diagnosis resulted in morbidity or mortality that was potentially avoidable with earlier diagnosis. Missed injuries have been referred to as "the trauma surgeon's nemesis."<sup>(1,2)</sup> Having a missed injury increases the risk of death and can directly cause death.<sup>(3,4)</sup> Even though not frequently life-threatening, they may result in significant long-term disability. A missed injury may stand out as the most memorable event in a patient's course, overshadowing the heroic efforts of the trauma surgeon and trauma team. In addition to proving embarrassing to the surgeon and institution, missed injuries are a common reason for litigation.<sup>(5,6)</sup> The aim of this study was to define the incidence of missed orthopaedic injury for adult major trauma patients and to examine the details of missed injuries in order to identify and make comment on potential risk factors for missed injury.

### Materials and Methods

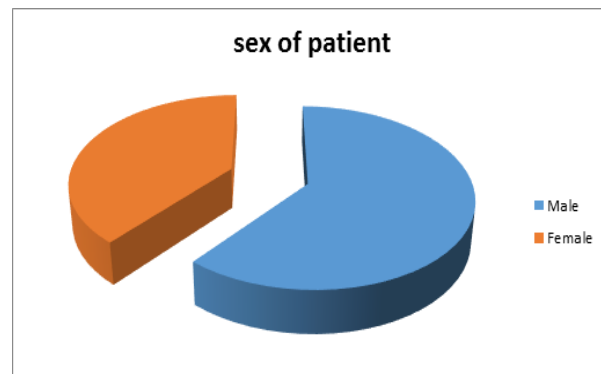
In this prospective study from the 671 admissions in orthopaedics indoor patients in a rural tertiary care centre for the period of 10 months from 1<sup>st</sup> January 2016 to 31<sup>st</sup> October 2016 were included. The patients were not aware of the study and it did not alter the regular care they received. The patient notes and radiology reports was reviewed daily whilst each

patient was an inpatient up to the end-point of discharge from hospital.

### Results

Out of 671 patients during the defined study period, 18 patients were identified with delayed diagnoses of the injury. Incidence rate of missed injury was 2.68%. The different parameters that were considered for this study are sex of patient, age, mechanism of injury, whether patient was under the influence of alcohol, GCS <8, whether patient was under shock and anatomical distribution of the missed injuries.

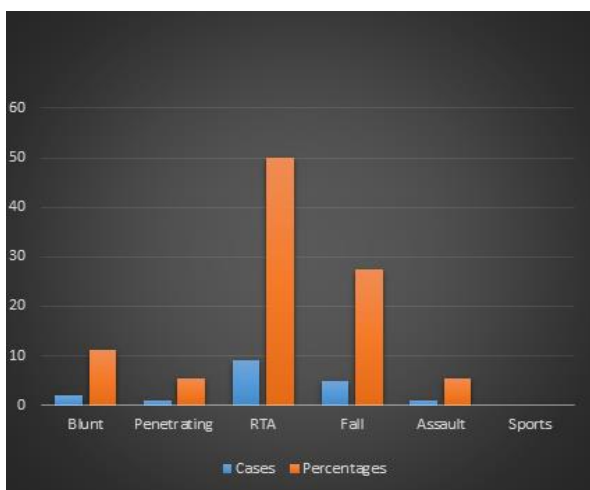
**Sex of Patient:** Out of 18 cases 11 were male and 7 were female.



**Age of Patient:** The median age of the study population was 46 years.

**Mechanism of Injury:** Out of the 18 patients with missed injuries 9 patients suffered road traffic accident, 5 had history of self-fall, 2 patients had blunt injury, 1 had penetrating injury, 1 had history of assault.

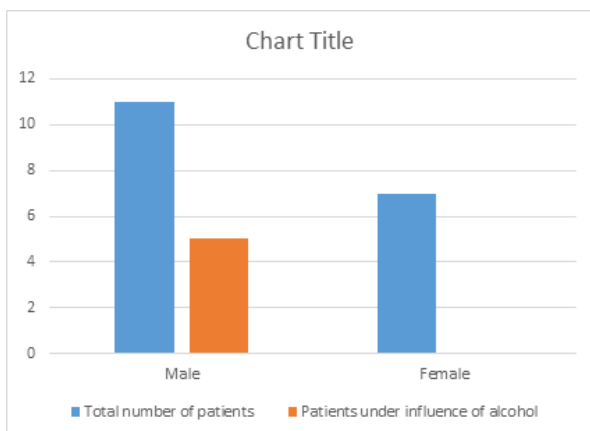
Mode of injury	Cases	Percentages
RTA	9	50
Fall	5	27.5
Blunt	2	11.1
Penetrating	1	5.5
Assault	1	5.5



**Under Alcohol Influence:** 5 of the 11 male patients were under the influence of alcohol.

But none of the female patients were under the influence of alcohol.

	Total number of patients	Patients under influence of alcohol
Male	11	5
Female	07	0



**Glasgow COMA Score (GCS):** A significantly higher proportion of patients in the missed injury population

had a Glasgow Coma Score (GCS) of eight or lower. In our study of 18 patients with missed injuries 5 patients had GCS<8.

**Patients with Shock:** Out of 18 patients with missed injuries 4 patients had shock (SBP<90 mm of mercury)

Parameters	Number of patients	Percentage
GCS <8	5	27.5%
SBP <90 mmhg	4	22.2%

**Anatomical Distribution of Missed Injuries:** 3 patients had missed neurological injury. Out of these 3 patients 2 had brachial plexus injury following clavicular fracture. 1 patient has missed injury to common peroneal nerve following proximal tibia fracture. 15 patients had missed bony injury. 5 patients had missed axial skeletal injuries which include clavicular fractures, ribs and vertebral fractures. 4 patients had missed upper extremity injuries whereas 6 patients had missed lower extremity injuries.

**Mortality Rate:** None of these 18 patients died because of the missed injuries. There were no differences between the patients with and without delayed diagnoses in terms of mortality.

**List of Missed Injury Cases**

Sr no	Diagnosed injury	Missed injury
1	Clavicle #	10 <sup>th</sup> rib
2	Clavicle #	Brachial plexus
3	Intertrochanteric #	Lat malleolus #
4	Rib #	L1 compression #
5	Tibia and femur #	Colles #
6	Humerus shaft #	2 <sup>nd</sup> Rib #
7	L1 compression fracture	Clavicle #
8	Hip dislocation #	Shaft 3 <sup>rd</sup> metacarpal #
9	Femur shaft #	Talus and medial malleoli #
10	Distal tibia#	Fibula neck#
11	Left Shaft of femur #	Tibial spine #
12	1 <sup>st</sup> rib #	Brachial plexus injury
13	Proximal tibia #	Peroneal nerve injury
14	Compound tibial #	5 <sup>th</sup> metatarsal base #
15	Head injury	Lateral condyle # of humerus
16	Femur shaft #	Tibial condyle #
17	Head injury	Clavicle # and rib #
18	Femur shaft #	scaphoid #

**Discussion**

Missed injuries have always been known to occur in major trauma patients. All body regions are at risk, such as the spine, ribs, and extremities.<sup>(7,8)</sup> The

following are patient, caregiver, and system factors to be considered in examining missed injuries or diagnosis delays

**Altered Level of Consciousness:** Patients with a decreased level of consciousness or head injury, with intubation/sedation or with alcohol or drug intoxication are unable to give a good history, cooperate with physical exam or identify sources of pain

**Hemodynamic Instability:** Hemodynamic instability or the need for immediate institution of life saving interventions frequently results in delays in diagnosis. Severely injured patients require many interventions to be immediately carried out to save their lives. In the process, the surgeon may bypass the orderly diagnostic work-up that is normally performed.

**Presentation with Multi-trauma:** Patients may have injuries, such as rib fractures or hip dislocation that are so painful that they distract the patient from identifying other sites.

**Low Index of Suspicion:** If healthcare providers assume that a minor mechanism produces no injury, patient priority is downgraded and they may not be examined properly or thoroughly.

**Technically Inadequate Radiology Exams:** Technically inadequate views included: missing a joint above or below a suspected fracture/injury, cervical spine series, chest films that do not include both shoulders or diaphragms and pelvic films that do not show the lower lumbar spine or both femoral heads.

**Other factors** for missing an injury include Inadequate Clinical Assessment, Misinterpretation of Studies and Late Presentation of Observable Findings.

Contributing factors to missed injuries were attributable to potentially avoidable factors or unavoidable factors. Avoidable factors include inadequate clinical and radiological assessment, avoidance of Low Index of Suspicion. Many physicians quote the need for performing a secondary examination after stabilising the patient. This involves re-examining the patient in the morning after injury and reassessing for the presence of a missed injury.<sup>(9,10)</sup>

Unavoidable factors include other life-threatening injuries, altered level of consciousness, presence of other distracting injuries, Delayed assessment, Delayed presentation. Altered level of mental deterioration was the most common unavoidable factor. The other unavoidable cause of missed diagnoses was a delayed presentation. Delayed presentation of injury was defined as an injury that was not clinically or radiologically evident on admission but became apparent upon repeat examination or imaging study. Patients with undetected injuries had longer mean stays in the hospital and longer intensive care unit (ICU) stays.

## Conclusions

This study shows that a small yet significant number of trauma patients had injuries that were missed

during initial assessment and diagnostic workup. Our study demonstrates that missed injuries can occur at any stage of the management of patients with major trauma. Repeated assessments, both clinical and radiological, are mandatory to diminish this problem. In initial evaluation, one still has to treat the greatest threat to life before complete diagnosis of all injuries, but alertness to evolving injuries must remain in mind throughout the patient's hospital stay.

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