**ORIGINAL RESEARCH**

# A study on the clinical profile of polytrauma patients admitted at a tertiary care hospital

[1]Dr. Nikil Kumar, [2]Dr. Ronald Joseph Menezes

[1]Resident (Final year Postgraduate), Department of Orthopedics, Father Muller Medical College and Hospitals, Mangalore, Karnataka, India
[2]Professor and Head, Department of Orthopedics, Father Muller Medical College and Hospitals, Mangalore,Karnataka, India

**Corresponding Author**
Dr. Nikil Kumar
Resident (Final year Postgraduate), Department of Orthopedics, Father Muller Medical College and Hospitals, Mangalore, Karnataka, India

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**ABSTRACT**
The modern world defines polytrauma as a syndrome of multiple injuries of defined severity [injury severity score (ISS) ≥ 15] with consecutive systemic reactions, which may lead to dysfunction of remote organs, also comprises the complex host response to the injury. Patients who met inclusion criteria were approached and educated regarding the study. Written informed consent was taken from each patient who consented for the study. Participants received a patient information sheet explaining the study. The selected patients were categorized into three groups i.e. stable, borderline, and unstable. The cause of injury was analysed where RTA-skid and fall from the bike accounted for most of the causes, 59% who went on to receive ETC and 36% who later went on to receive DCO. There was a statistically significant difference as to the cause of injury between the ETC and DCO groups.

**Key words:**Clinical profile, polytrauma patients, ETC and DCO



## INTRODUCTION

The term polytrauma originates in the Greek words poly (multiple) and trauma (wounds) indicating a complex injury pattern of different anatomical regions. In 1975, Border *et al.* defined the poly-traumatized patient "as any patient with two or more significant injuries".[1] Despite the availability of anatomic scoring systems in the 1970`s, the Injury Severity Score (ISS) was not used as part of any definition of 'polytrauma'. Anatomical definitions of polytrauma based on the ISS began to appear in the literature in the early 1990s. Pape HC *et al.*, in the year 2000 stated that an ISS>/= 8 as a definition of polytrauma. The modern world defines polytrauma as a syndrome of multiple injuries of defined severity [injury severity score (ISS) ≥ 15] with consecutive systemic reactions, which may lead to dysfunction of remote organs, also comprises the complex host response to the injury.[2]

During trauma the so called 'First hit phenomenon'is defined by the impact, duration, and direction of the effective force of injury. The patient responds to initial trauma by release of vast amount of RNA, DNA, cytosolic organelles, matrix and membrane fragments, and other molecules functioning as danger associated molecular patterns (DAMPs). Trauma destroys the structural integrity of various tissues and uncover molecular structures resulting in an excessive exposure to numerous "unknown" antigen structures and neoepitopes. These responses to first hit are triggered and managed by numerous "danger-sensing molecules" of plasmatic defense cascades (e.g., coagulation cascade, kallikrein-kinin system, complement system, acute phase reaction).[3] Complement system, C1q, C3b, and mannose bindinglectin recognizes DAMP and translate the danger signals into a specific cellular signaling and an effective immune response. Damage of external and internal barriers (e.g., skin and gut mucosa) facilitates invasion and translocation of microorganisms, resulting in massive release of pathogen-associated molecular patterns (PAMPs). In cases of additional insult like extensive surgical procedures, anaesthesiologic interventions, additional stress (e.g., hypoxia, hypothermia, microbiological invasion)contributes further to the pathophysilog.[4]

There is aphase of danger escalation characterized by an uncontrolled and excessive release of pro-inflammatory cytokines, chemokines, neuromediators, heat shock proteins, and oxygen radicals, which is clinically reflected as SIRS or sepsis (if microorganisms are involved) and later manifesting as multi organ dysfunction syndrome, 'a Second hit phenomenon'. During the initial era of trauma management assessment of the polytrauma patient clinical status relied only on systolic blood pressure.[5] The first criteria for appraising blunt trauma patients for orthopedic surgery were published in 1978 and suggested the use of systolic blood pressure, heart rate, central venous pressure, and hematocrit for essential evaluation. Allgöwer's group developed shock index that uses the ratio between the systolic blood pressure and the heart rate. If this ratio drops below a value of one, the patient is defined as in shock. An initial shock index greater than 0.9 implies a worse prognosis 24 h after injury.[6]

## METHODOLOGY

### SOURCE OF DATA

All polytrauma patients admitted and treated at Hospital with lower limb long bone fractures satisfying inclusion and exclusion criteria.

**STUDY DESIGN:** Prospective Observational cohort study. Evidence based diagnostic and treatment protocols were already existent in our centre. We just observed the entire process from admission through surgery to 3 months and 6 months outpatient follow up. No intervention was performed for the purpose of the study.

**STUDY TOOLS:**Revised Trauma Score-was used to define and classify polytrauma patients.

**INJURY SEVERITY SCORE:**Was used to group patients according to the severity of injury. This enabled segregating patients to the correct treatment group, either ETC or DCO, as per internationally accepted standard treatment guidelines.

**LOWER EXTREMITY FUNCTIONAL SCALE:** This was used to measure the functional quality of patients in each group at 3 months and 6 months outpatient follow up.

**STUDY POPULATION:** Patients who met inclusion criteria were approached and educated regarding the study. Written informed consent was taken from each patient who consented for the study. Participants received a patient information sheet explaining the study. The selected patients were categorized into three groups i.e. stable, borderline, unstable.

### INCLUSION CRITERIA

1. Patient aged 18 years and above with lower limb long bone fractures.
2. Polytrauma patients managed through early total care.
3. Polytrauma patients managed through damage control orthopedics.

### EXCLUSION CRITERIA

1. Patients lost to follow up were excluded retrospectively at the time of analysis.
2. Severely injured polytrauma patients who succumbed to the injury before definitive orthopedic management.
3. Patients with preexisting conditions influencing the management of polytrauma for example patients with CKD, under chemotherapy, dialysis.

## RESULTS

The mean age of those who received ETC was 36 years and it was 32 years for those who received DCO (figure, Table). The standard deviation was around 13 years for the ETC group and 9 years for the DCO group. The difference in the mean age and its standard deviationwas not statistically significant with a *p* value of 0.067.

**Table 1: Mean age in years and standard deviation of patients who received ETCand DCO.**

| AGE | | | | | |
|---|---|---|---|---|---|
| | group | N | Mean | Std. Deviation | t |
| AGE | DCO | 61 | 32.885 | 9.861 | 1.845 |
| | ETC | 61 | 36.852 | 13.591 | p=0.067 ns |

An insignificant *p* value of 0.067 resulted from a paired t test.

**Table 2: Percentage distribution of gender among polytrauma patients**

| | Sex | | | | | |
|---|---|---|---|---|---|---|
| | **ETC** | **Percent %** | **DCO** | **Percent %** | **Total** | **Percent %** |
| F | 29 | 47.6 | 14 | 22.9 | 43 | 35.25 |
| M | 32 | 52.4 | 47 | 77.1 | 79 | 64.75 |
| Total | 61 | 100 | 61 | 100 | 122 | 100 |

79 out of 122 patients were male accounting for 64.75 percentage of the total study population.

The cause of injury was analysed where RTA-skid and fall from the bike accounted for most of the causes, 59% who went on to receive ETC and 36% who later went on to receive DCO. There was a statistically significant difference as to the cause of injury between the ETC and DCO groups.

**Table 3: Cause of injury between ETC and DCO**

| CAUSE OF INJURY * group | | | | |
|---|---|---|---|---|
| | | group | | Total |
| | | DCO[a] | ETC | |
| Fall from height | Count | 19 | 8 | 27 |
| | % | 31.1% | 13.1% | 22.1% |
| RTA Skid and fall from bike | Count | 22 | 36 | 58 |
| | % | 36.1% | 59.0% | 47.5% |
| RTA- 2Wheeler vs 4Wheeler | Count | 20 | 16 | 36 |
| | % | 32.8% | 26.2% | 29.5% |
| RTA- Skid and fall from bike | Count | 0 | 1 | 1 |
| | % | 0.0% | 1.6% | 0.8% |
| Total | Count | 61 | 61 | 122 |
| | % | 100.0% | 100.0% | 100.0% |
| . x2=9.305 p=0.025 sig | | | | |

RTA-skid and fall from the bike accounted for the maximum number of injuries. There was statistically significant differences between groups. *p= 0.025*

We did not find statistically significant difference in weighted RTS between patients who were assigned to receive ETC and DCO. The mean weighted RTS was 7.39 and 7.35 respectively (Tableand figure). The paired t test did not reveal a statistically significant *p* value 0.69.

**Table 4: Mean weighted RTS between patients meant to receive ETC and DCO**

| WEIGHTED RTS SCORE | | | | |
|---|---|---|---|---|
| group | N | Mean | Std. Deviation | t |
| DCO | 61 | 7.359 | .522 | .399 |
| ETC | 61 | 7.395 | .472 | p=0.69 ns |

The mean scores were not significantly different. *p* = 0.69.

Classification based on NISS scores revealed significant difference between ETC and DCO groups with a mean score around 23 and 33 respectively with*p* value < 0.001.

**Table 5: NISS injury score shows patients who underwent DCO therapy had higher injury scorescompared to those who received ETC**

| NISS | | | | |
|---|---|---|---|---|
| group | N | Mean | Std. Deviation | t |
| DCO | 61 | 32.967 | 5.950 | 11.503 |
| ETC | 61 | 23.230 | 2.883 | p<0.001 vhs |

This difference was statistically significant.

**Table 6: Numbers and percentages of patients classified as Stable, Unstable, Borderline based on the four physiological parameters for both ETC and DCO groups**

| | | group | | Total |
|---|---|---|---|---|
| | | DCO[a] | ETC | |
| Stable | Count | 6 | 41 | 47 |
| | % | 9.8% | 67.2% | 38.5% |
| Unstable | Count | 18 | 0 | 18 |
| | % | 29.5% | 0.0% | 14.8% |
| Borderline | Count | 37 | 20 | 57 |
| | % | 60.7% | 32.8% | 46.7% |
| Total | Count | 61 | 61 | 122 |
| | % | 100.0% | 100.0% | 100.0% |
| a. x2=49.134 p<0.001 vhs | | | | |

We classified the grade of injury based on four physiological parameters like hypovolemic shock, coagulation profile, temperature and severity of injury.

The mean and standard deviation of LEFS scores during the third and sixth month outpatient follow up with its significance based on paired t test is given in table 4A. It is clear from the table that the LEFS scores at 3 months and 6 months did not show any significant difference betweenthe ETC and DCO groups. However, there is a significant improvement in scores at six months follow up compared to the 3 month followup. A paired t test demonstrated a significant *p* value <0.05.

## DISCUSSION

In this study, 122 patients were analysed. 64% of poly trauma patients were aged between 20 to 40 years of age and road traffic accidents involving skid and fall from the bike accounted for 36 to 59% of injuries. The subjects were initially managed based on the ACLS protocol.

The New Injury severity score was then calculated based on the involvement of three highly injured AIS body regions. Classification based on NISS scores revealed a significant difference between ETC and DCO groups with a mean score around 23 and 33 respectively with a *p* value < 0.001. Lavoie André *et al*., in the year 2002 conducted a study on 24,263 patients from three urban Level I trauma centers in the province of Quebec, Canada. Receiver operator characteristic (ROC) curves and Hosmer-Lemeshow statistics were used to compare discrimination and calibration of NISS and ISS models and concluded that NISS is a more accurate predictor of in-hospital death than the ISS and should be chosen over the ISS for case-mix control in trauma research[7].

The subjects were classified into stable, unstable and borderline based on the physiological parameters of the main four pathological cascade of polytrauma and injury severity score. Of 47 stable patients, 61.2% (n=41) underwent ETC and 9.8% (n=6) patients were under DCO based on underlying co morbidities. Among 57 borderline patients, 60.7% (n=37) underwent DCO and 32.8% (n=20) underwent ETC. Unstable patients (n=18) 14.8% were treated based on DCO based on the study of Hans-Christoph Pape *et al*. in the year 2005 using the PubMed database of the United States National Library of Medicine to determine the timing of fracture fixation in blunt trauma patients[8].

## CONCLUSION

In our study, 64% of poly trauma patients were aged between 20 to 40 years of age. Patients under 20 years and above 50 years of age accounted for less than 20% of poly trauma patients. Road traffic accidents involving skid and fall from the bike accounted for 36 to 59% of injuries. 67% of patients classified under "Stable" received ETC, whereas 60% of patients classified as "Borderline" received DCO.

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