

Outcome Analyses of Emergency Care of Trauma Patients with Reference to the Type of Injury, Treatment and Cost

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This present prospective analytic study describes the experience in the management of Orthopaedic trauma patients with reference to type of injury, type of procedure and the cost of acute care. This study was carried out at the Department of Orthopaedics, Traumatology and Rehabilitation (unit II), Mayo Hospital Lahore, from April 2001 to October 2001. This included all the patients who presented to the Accident and Emergency department of Mayo Hospital with musculoskeletal trauma. A total of 807 patients presented during this period of six months, with the mean age of 39 years and male to female ratio of 3.25:1. All the patients were resuscitated according to ATLS manual and were evaluated for further management. The commonest mode of trauma was Road Traffic accident (43.4%) followed by domestic accidents, spot and work related injuries and violence in the percentage of 29.2, 19.2 and 8.1 respectively. 94.3% of the patients presented with fractures and 5.7 with dislocations, of those with fractures 62.3% were closed and 32% were open fractures. Lower limb injuries (53.64%) were found to be the commonest followed by upper limb (44.73%) and spine (1.61%). The incidence of poly trauma was found to be 7.39%. The cost of the emergency care, per patient, spend both by the hospital and by the patient himself ranges from 485/= Rupees to 4200/= rupees with an over all average of 1500/= per patient. Out of these 807 patients 49 % patients were treated and discharged from the Emergency department on the same day, 45.6% of the patients were admitted for further management, 1.36 % of patients, who have other associated disease, were shifted to the other departments, 0.76% were shifted to the Intensive Care Unit and 3.22 patients left the Hospital against the medical advice.

Key words. Musculoskeletal trauma, emergency care, fractures, cost analysis.

Trauma can be defined in terms of the bodily injury severe enough to pose a threat to life or limb that need immediate intervention¹. Trauma, as a major cause of death, is surpassed only by ischaemic heart disease and carcinoma². This holds true even in acquired immunodeficiency syndrome prevalent areas of the world⁷. Yet, the National Academy of Science in the United States has labeled it as the "Neglected disease of the modern society". A similar view prevails in the UK, where a leading emergency surgeon has referred it, as "the trauma is the neglected stepchild of the modern medicine". Indeed, it is the leading cause of death in either sex, in people aged 1-35 years^{2,3}. In the UK, approximately 18 000 people die each year, with 60 000 hospital admissions costing 2.2 billion pounds, which represent 1% of gross national product (GNP)^{2,4}. In the USA, it is the largest cause of death in the population 44 years old and younger, more than all other causes of death combined for this age group^{2,5}, approximately 60 million people are injured annually; 30 million require medical treatment and 3.6 million require hospitalization^{2,5}. On an average in USA, 150 000 people per year die from trauma related causes and almost half a million people sustain injuries leading to permanent disability^{5,6,7}. Trauma related monetary costs in the USA are greater than \$ 400 billion annually^{2,5}. For every injured-related death there are 10 other survivors with serious injury, two of who will have permanent disability, whom will require continuing health-care facilities for life⁷. Motor vehicle accidents remain the single most common cause of trauma-related mortality (32%), followed by gunshot wounds (22%) and falls (9%)^{8,9}. All

though the exact figures are not available for Pakistan one can imagine that the rate of mortality and morbidity will be much more higher than those of the developed world.

Historical background

Approaches to the treatment of fractures have evolved over time. Certainly the fundamental tenet of fracture management is to reduce pain; immobilization with some sort of external device wrapped about the fracture undoubtedly did so, even in the prehistoric times. The next logical step to take would be to realign the broken limb. One of the earliest attempts, dating to approximately 1000 AD is from Albucasis, an Arabian surgeon and medical encyclopedist living in Spain, who used bandages and cloths applied to the affected area and stiffened it by application of the egg albumin¹⁰. Elsewhere in the Arabian world plaster was being used to immobilize the fracture, the initial attempt involved making a box or container around the affected limb and pouring plaster into the box, immobilizing the affected area. Antonius Mathijson (Flemish army surgeon) is credited with developing plaster of Paris bandages in approximately 1852. He prepared a plaster material or gypsum and applied it to the bandages that were subsequently wetted and applied to the affected areas. Now we have the most refined forms in terms of fast acting, medium acting and slow acting material¹⁰.

Evaluation of orthopedics trauma

Fractures and dislocations, which occur in a significant no of trauma patients, may result from indirect or direct force¹¹. Evaluation of the trauma patient with a fracture or

dislocation should always include a complete musculoskeletal examination. Careful attention should be paid to the mechanism of injury, which should aid in the treatment of the patient and provide prognostic information^{10,11}.

Trimodal distribution of death from trauma

The first peak of mortality occurs at, or shortly after, the time of injury. These patients die of major neurological or vascular injury and most are unsalvageable with the present day technology, but various prevention programmes could avoid 40% mortality¹². The second peak occurs several hours after the injury. These patients commonly die from airway, breathing or circulatory problems and many are potentially treatable. This period is traditionally known as the "Golden hour", to emphasize the time following injury when resuscitation and stabilization are critical^{12,13,14}. The final peak occurs days or weeks after injury. These victims die from multiple organ failure (MODS), adult respiratory distress syndrome (ARDS) or over whelming infection. It is now known that inadequate resuscitation in the immediate or early post trauma period leads to an increased mortality rate during this phase¹².

Incidence of orthopedics trauma

Motor vehicle crashes are leading cause of trauma from age 01 to 35 years, accounting for 40,000 deaths and 500,000 hospitalizations per year in UK². Falls from height is the second most common cause of trauma affecting all age groups but particularly elderly with age more than 60 years^{15,16}. Of these patients about 30% to 40% of patients have associated orthopedics trauma. About 30% to 50% of the total cost of hospital emergency expenditures are spent on orthopedics trauma patients¹¹.

According to one study in accident and emergency department about 60% of the injured patients have associated orthopedics trauma³. Injuries to the musculoskeletal system often appears dramatic and occurs in 85% of patients who sustain blunt trauma, but rarely cause an immediate threat to life or limb. However, musculoskeletal injuries must be assessed and managed properly and appropriately so that life and limb are not jeopardized. One should learn to recognize the presence of such injuries, define the anatomy of the injury, protect the patient from further disability and anticipate and prevent complications¹⁷.

Major musculoskeletal trauma indicates significant forces sustained by the body. For example, the patient with long bone fractures above and below the diaphragm has an increased likelihood of associated internal torso injuries^{17,18}. Unstable pelvic fractures and displaced femur fractures may be accompanied by brisk bleeding, resulting in hemodynamic abnormality²⁰. Severe crush injuries cause the release of myoglobin that can precipitate acute renal failure. Swelling into an intact musculofascial space can cause an acute compartmental syndrome that, if not diagnosed and treated, may lead to lasting impairment and

loss of extremity use¹⁸. Fat embolism is often uncommon but highly lethal complication of long bone fractures, which may leads to pulmonary infarct or cerebral impairment¹⁷.

Management of orthopedics trauma

Almost by definition, a patient with orthopedics injury has sustained some kind of trauma.

Musculoskeletal trauma does not warrant a recording of the priorities of resuscitation (ABCDEs)^{1,2}. However, if it is associated with other injuries it is mandatory to follow the proper protocol of resuscitation. Musculoskeletal cannot be ignored and treated at a later time¹¹. Despite careful assessment and management of the multiply injured patient, fractures and soft tissue injuries may not be recognized initially and needs repeated re-evaluations^{11,12}.

During the phase of acute care, it is imperative to recognize and control bleeding (if present)⁴. Hemorrhage from long bone fractures can be significant^{5,6}. Certain femoral fractures may result in up to 3 to 4 units of blood loss into thigh, producing class III shock^{2,5}. Appropriate splintage of the fracture provided during acute care can significantly reduce bleeding and its consequent results². The goal of the fracture immobilization is to realign the injured extremity in as close an anatomical position as possible and to prevent excessive fracture site mobilization. This is accomplished by the application of in-line traction to realign the limb and is maintained by an immobilization device. In case of open fractures applying external fixation carries out appropriate immobilization. Joint dislocations are reduced and splintage applied^{3,6}.

Aims and objectives

The present prospective analytic study describes the experience of management of Orthopaedic trauma patients with reference to type of injury, type of procedure and the cost of acute care.

Material and methods

This prospective analytic study was carried out in department of orthopedics, Traumatology and rehabilitation (unit II) Mayo Hospital Lahore from April 2001 to October 2001. All the patients presented to accident and emergency department of Mayo Hospital Lahore with musculoskeletal trauma either as a primary assault or in association with other injuries, were included in this prospective study. All the patients were examined for the injury, analgesics were given to relieve the pain and splintage of the fractures was performed at the initial stages of resuscitation. X-rays were performed to know the exact anatomical site of the injury and to plan for further management. Age, sex, mechanism of injury, type of injury and type of procedure were all noted. The cost of the acute care was also noted; both afforded by patients and by the hospital. Appropriate antibiotics were given intravenously in all patients with open fractures. After making accurate diagnosis in patients, different procedures

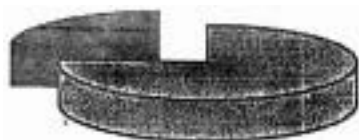
were undertaken depending upon the type of injury, extent of injury and the general condition of the patient. Check X-rays were performed in all patients. The patients, where closed reduction was appropriate and there were no signs of any procedure or injury related complication, were discharged with proper instructions and with advice of follow-up in next out patient department. The patients, where either closed reduction were not successful or where the fracture is open, they were admitted in the ward to ensure proper management.

Results

Over a period of six months from 18th April 2001 to 19th October 2001, 807 patient's presents to the accident and emergency department of the Mayo hospital with the diagnosis of musculoskeletal trauma who are managed in the orthopedics department unit II. Out of 807 patients 618 were male and 189 were female (Fig 1). The mean age of the patients was 36 years (Table I).

Figure 1: Sex Incidence

Female
23%



Male
77%

Table I. Age Incidence.

Age	n=	%age
Below 20	222	27.5
20-40	239	29.6
40-60	220	27.2
Above 60	126	15.6
Total	807	100

A Road traffic accident was found to be the most common cause of the trauma followed by Domestic accidents and injuries at work. In cases of domestic accidents the incidence is higher of history of fall with predominance of female patients of old age (table II). In about 8% of patients the mode of trauma was violence the commonest being firearm injury. Open fractures accounts for 31.9% and close fractures for 62.3 % of cases (table no III).

Table II Mode of trauma.

Mode of trauma	n=	%age
RTA	351	43.4
Domestic	236	29.2
Sport/at work	154	19.2
Violence	66	8.1
Total	807	100

The fractures of the upper limb were most common followed by lower limb fractures (Figure II). 7.2% of the patients had poly trauma, that is, more than one limb is fractured. In almost every patient some procedure was performed ranging from closed reductions to open reduction and internal fixation (table no IV).

Table III. Type of fracture/ dislocation.

Type	n=	%age
Open	258	31.9
Close	503	62.3
Dislocation	46	5.7
Total	807	100

Figure II: Site of fracture

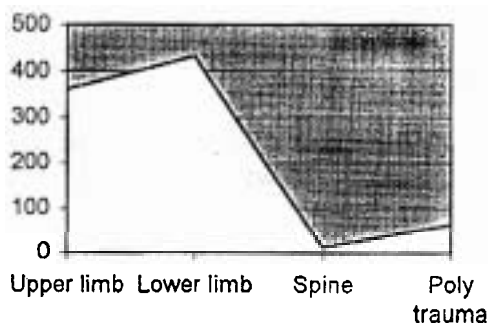


Table IV Procedures done in accident and emergency

Procedure	n=	Average
Closed reduction POP	316	39.1
ORIF	59	7.3
Skeletal traction	172	21.3
Skin traction	111	13.5
Back slab	91	11.2
External fixation	58	7.1
Total	807	100
Debridement	239	

Discussion

Trauma is an important health problem. With the anticipated decline in communicable diseases and nutritional problems in the next millennium, trauma might replace communicable diseases as a major problem and rank second only to non-communicable diseases²⁹.

A trauma patient is a victim of an externally caused injury that results in major or minor tissue damage or destruction caused by intentional or unintentional exposure to thermal, mechanical, electrical, or chemical energy, or by absence of heat or oxygen²⁹. Orthopedics trauma is one of the major part of accident and emergency medicine. According to varying studies the orthopedics trauma can range from about 30%¹¹ to more than 60% in emergency settings^{3,24}. It constitutes an important part in trauma management. This present study describes our experience with the management of the trauma patients with special

reference to the type of injury, its treatment and cost of the acute care.

In present study, most of the patient's presents in their second, third and fourth decade of life, which is quite similar to the local studies and the international data available^{8,30,31}. But the discrimination of the sex is different when compared with the international data, as they have either the same incidence of male to female ratio or have a very slight difference, probably because their women in more exposed to the circumstances leading to trauma as for example driving, industrial work, sports. Table no V.

Table V. Age and sex comparison.

	Age (aveg)	Sex. M:F
Present study	39	3.25:1
A A Abbasi et al. (8)	46	2:1
Murray C et al. (30)	30	2:1
Lau PTC et al. (31)	40	1.5:1

Road traffic accident is a leading cause of trauma worldwide. In our present study 43.4% of the patients presented with RTA, followed by domestic accidents (29.2%), work / sport accidents (19.2%) and violence (8.1%). This patron of distribution is same when compared with local studies but is different when compared with international data, because domestic accidents and violence related trauma is not as high as in our population^{27,30,32}. Table VI.

Table VI. Comparison of mode of trauma.

	RTA	Domestic	Sport/ Work	Violence
Present	43.4%	29.2%	19.2%	8.1%
Murray et al. (30)	79.4%	6.6%	11.8%	2.2%
West JG et al (32)	69%	18%	12%	1%

In this present study about 94.3% of the patients presented with fractures either of the open or close type, and 5.7% of the patients presented with dislocations and 7.3% with polytrauma where more than one limb was fractured. When this data is compared with intrnational studies it is observed that the incidence of the fractures are almost the same, but the difference lies in the incidence of open and close fracture ratio, since the violence and related open fracture is low as compared to our population^{16,24,25} Table VII.

Table VII. Comparison of patron of injury.

	Open	Close	Dislocation
Present	31.9%	62.3%	5.7%
Wick M et al (16)	19.3%	71.1%	9.6%
K.C.K. NG et al (24)	95.1% (total fractures)		4.9%

In our present experience it was observed that the average cost of acute care is about 1500 Pak Rupees (25 US\$). In a similar study conducted for the cost analysis of trauma patients in Germany it was found out that one patient cost about 4,700 DM per day (1330 US \$)¹⁶, similarly a study conducted at Queen Mary Hospital Hong Kong it was observed that a patient with skeletal trauma costs about more than 500 US \$ in acute care.

Table VIII. Cost analysis

Cost (Rs.)	Cost (\$)	n=	Average
< 500	8.3	184	22.8
501 – 1000	8.3-16.6	353	43.7
1001 – 2000	16.6-33.33	167	20.6
2001 – 3000	33.33-50	47	5.8
3001 – 4000	50-66.66	56	6.9
Total		807	100

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