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A CROSS SECTIONAL STUDY OF PATTERN OF EXTREMITY INJURIES IN 1038 POLYTRAUMATISED PATIENTS

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Abstract:

Background: There is ever rising incident of polytrauma in today's world, which raises major issues and questions on our preparedness regarding handling of major polytrauma patients. At SMS Orthopaedic and trauma center, Jaipur, we come across major patient load of polytrauma patients from all across Rajasthan and other neighboring states. Literature at this point providing least amount of data regarding polytraumainjury patterns in India thus there was need to conduct a study to analyze pattern of injuries in large group of Indian polytrauma patients.

Material and methods: The study included 1038 poly-traumatized patients admitted in polytrauma ward of Trauma center of SMS Hospital, Jaipur between January 2016 and November 2016. It is a hospital based non-interventional cross-sectional study.

Results: Younger age group commonly involved (51% patients were below 30 years), males were 86% of cases. 75% cases were caused by Road traffic accidents mostly in urban areas between 1 to 6 pm. lower extremities were injured commonly with grade 3 open wounds, foot and hands were mostly involved in crush injuries and transtibial amputation being commonest among amputations, head injury was the most commonly associated injury with polytrauma patients.

Conclusion: Its required to improve the public awareness about the

facilities available for polytraumatized patients, along with improvement of condition of roads, obeying of traffic rules, trauma center concept, availability of trauma specialist team in hospitals are other areas which need improvement.

Key words: Polytrauma, Extremities, Injury, Pattern, Multiple, Fractures

Introduction

In present scenario, it is felt that a detailed study of extremities injuries can yield a valuable data. It is essential to know as precisely as possible the incidence of accidents involving the extremities and the cause of these accidents. Only with these facts we will be able to evaluate the cost of management of these accidents and the ergo-economic burden they present to the society. This study aims to analyse the spectrum of extremity injuries among the patients reporting in the accident-emergency (Trauma Center) of S.M.S. Medical College and Hospital, Jaipur during the period of one year.

Extremity injuries are the commonest injuries sustained following polytrauma.^{1,2} Polytrauma exists when there is significant injury to 2 or more organs in different systems. There could also be injuries to two or more organs in the same system as is the case in multiple fractures. Polytrauma also defined by Injury Severity Score (ISS) >16.

Due to the complexity of the injuries and the diversity in the type of accidents, there are few commonalities between the patients, and care and treatment must be specific to the patient's needs.³ With increase in urbanization and industrialization more and injuries of varied type are increasing day by day. Industrialization and increase vehicles giving rise to more polytrauma patients, who require not only urgent treatment, but also different types of attitude, approach, dedication, planning, preparedness and the well-coordinated as well as timely team-work to have an effective outcome of a "Golden hour". Crucial stage occurs from 1 – 4 hours after the accident and it is often when most of the emergency

treatment occurs.⁴ During this stage, the most common cause of death is from hypovolemic shock.⁵ Once a patient passes through this stage and is stabilized, the individual's chance of survival increases greatly. However, the patient is still at risk of developing complications or succumbing to multiple organ failures. This can occur within the first few weeks of recovery.⁶

Each year 300 000 people die of RTA and more than 8 million people suffer injuries. India is the leading country in the number of deaths due to RTA.⁷ In 2015, 146133 people died of RTA in India alone. It is estimated that by the year 2020, 8.4 million people will die every year from injury, and injuries from road traffic accidents will be the third most common cause of disability worldwide and the second most common cause in the developing world.⁸

Although sophisticated prehospital and trauma centre systems have been shown to reduce the number of preventable deaths after trauma.⁹

Material and Methods

The study included 1038 polytraumatized patients admitted in polytrauma ward of Trauma center of SMS Hospital, Jaipur between January 2016 and November 2016. It is a hospital based non-interventional cross-sectional study. The study was conducted at the Sawai Man Singh Medical College and Hospitals, Jaipur. It included patients with extremity injuries presenting in the accident-emergency department (Trauma Center) having other associated organ/system injuries with ISS score >16. Ethical approval was taken from our hospital Ethical Committee. Trauma center of SMS Hospital, Jaipur receives primary/referred patients from all parts of Rajasthan and

some part of Uttar Pradesh, Haryana and Gujarat. It provides advanced emergency services. This study intends to analyse the incidence of different type of extremity injuries, to suggest preventive measures for different types of extremity injuries, to assess the size and nature of problem so as to assist in planning of services in this geographical area.

Inclusion criteria was all polytrauma patients presenting primarily or referred after first aid to the Accident-Emergency department of the hospital with close or open extremities injuries including soft tissue injuries of upper and lower limb with Injury Severity Score (ISS) >16.

Each patient admitted to Polytrauma ward of Trauma Center of SMS Hospital, Jaipur was thoroughly inquired and examined and all the relevant points were noted for records. Diagnosis were based on the history and physical examination, reinforced when indicated by radiology. Polytrauma was considered as the simultaneous injury of different regions of the body and where either one or the combination of these with ISS value more than 16.

Results

Age distribution among the patients ranged from 2 yrs to 82 yrs with a mean 33.2 ± 15.6 yrs. 533 (51.34%) of patients were aged below 30 yrs. Age group (16 to 30 yrs) was most commonly involved in male as well as female category because these are more involved in outdoor activities. There were 901 males (86.8%) and 137 females (13.2%) in our study.

Patients belonging to rural area (62%) more commonly underwent polytrauma as compare to urban area (38%). Although 25.5% of population of Rajasthan resides in urban so

relatively urban people are more prone to poly trauma. It may be due to heavy traffic in urban area than rural.

Out of 1038 poly-traumatised patients 778 (75%) were injured by road traffic accidents. Fall from height was the second most common mode of injury. Most of accident / polytrauma (48%) occurred in day timespecially between 1 to 6 pm. and least commonly between 12 am to 6 am (3.5%) which correlate with usual timing of outdoor activities among people. Lower extremity (50.28%) is more commonly injured in polytraumatised as compare to Upper extremity (32.41%). Great majority of polytraumatised patient have open type of extremity injury.

Open type of extremity injuries further grouped into three types according to **Gustilo and Anderson classification.**

Table 1

G. A. Type	No. of Cases	Percentage
I	35	06.03
II	157	27.02
III	389	66.95
Grand Total	581	100.00

As ISS value calculated for each polytraumatised patients co-relates its severity. Majority of patients in our study have ISS value (16-45) very few patients had ISS value >60.

72 patients representing 6.93%, had joint injury (dislocation). Hip dislocation accounting for (33.3%) of total joint injury, is found to be most common joint injury in polytraumatised patients.

Humerus (27%) and both bone forearm(32%) are the commonest bones injured in upper extremity , while femur (25%) and leg bones(51%) in lower extremity.

Hands and Feet are the most

common extremity parts crushed in polytraumatised patients

Head injury was associated with extremity injury in 53% of polytraumatised patients followed by spine (13%) and chest (13%) injuries.

Discussion

When a person is in motion or on a vehicle, the body is propelled by kinetic energy (E), the amount of which is proportional to the square speed(V) of the vehicle($E=1/2MV^2$). On sudden impact, there is conversion of this energy to potential energy; this is usually associated with injury to the musculoskeletal system often resulting in the fracture of a bone or injury of other body system such as head, spine, chest, abdomen etc. The degree of damage to the bone is proportional to the force of impact and therefore the energy involved. The most vulnerable parts of the body to be injured are the extremities and as shown in this study, the lower extremities are more involved.¹⁰ Most of these however, are not fatal¹¹, the middle aged being more prone.¹² When some vital organs or organ system are involved, mortality becomes higher. These include head and chest injuries.¹³ If current trends continue, road crashes are predicted to become the fifth leading cause of death by 203021. In India, "injury" contributes to 9% of total mortality annually and is the third leading cause of death. Road traffic accident (RTA) is an emerging public health problem in India. Rapid disorganized urbanization, exponential growth in the numbers of motor vehicles, non-abidance of traffic rules and higher velocity of traffic are all possible factors contributing to the increasing burden of RTA's in developing countries.¹³

Pedestrians, passengers and cyclists

are involved commonly in third world RTA's as opposed to drivers in the developed World.¹⁴ A study showed road traffic accident's to be the major cause of death amongst medico legal autopsy cases.¹⁵ In a study conducted in Eastern Nepal over a one year period (n=870), Jha et al reported that 30% of road traffic accidents involved the 20 -29 years age group.¹⁶ Laborers (27.6 %) and students (24.1 %) were the ones most involved.¹⁶

Rao et al reported that majority of RTA's had injuries around the head and face (34.64 %) followed by the lower limbs (25.19%), upper limbs (13.38%), chest (8.26%), skin (9.05%), abdomen (3.14%) and spine (6.29%).¹⁷ In their study, the motorcyclist constituted the majority of cases (41.73%) followed by the passengers of bus, minibus and trucks (34.25 %) with a male to female ration of 5.4:1.¹⁷ Gunjan et al found that bony injuries were common with RTA's and these were often associated with multiple injuries, blunt injuries, abrasions and lacerations. They found lower extremity involvement in 45.39 % cases, multiple sites in 26.95 %, upper extremity in 13.5% and head and neck involvement in 14.2%. The majority of victims (75%) were 18-37 years old males (86 %). Two wheelers and light motor vehicles were involved in most cases (63%).¹⁸

In present study 1038 polytraumatised patients were selected having extremity injuries of various pattern.

Mean age of the total patients selected was 36.23 years. Almost 70% of the victims were between 16 to 45 years of age and 88% of these were males. One could assume that massive losses in productivity would be incurred with involvement of this age group. Children and elder persons less commonly undergo polytraumatised

as compared to young adults.

Road traffic accident caused 72% of the injuries. This pattern of aetiology of trauma generally and polytrauma in particular, also had been reported in Nigeria by Ayeni in 1980.¹⁹ In our study motorcycle riders were found to be the most vulnerable group involved RTA.

Among the admitted injured patients, majority were from accidents in rural area because in urban area overcrowding on roads results in low-velocity injuries causing minimal damage to the patient for whom admission is not required.²⁰

Our study points out that most of polytrauma occurs in daytime rather night, mainly between 1PM and 6PM which correlates with usual timing of maximum outdoor activity in this area and our country.

Out of total extremities injured in polytraumatised patients (56%) had open type of extremity injury.

The wide range of fractures seen in this study showed that virtually any bone in the body could be fractured in polytrauma and any pattern of combination could occur. We found lower limb fractures (48.5%) much more common than upper limb fractures (30.4%) . 21.1% had both upper and lower limbs injured which is keeping with Similar findings reported by Oluwadiya et al.²¹

Crushed foot was mainly due to fall/crossing over of heavy object while crushed hand was mainly due to machine injury most of them had mangled extremity severity score greater than 7. Helfet et.al²² in their study in 1990 showed that all patients with mangled extremity severity score >7 had amputation. Metatarsals and calcaneum were most commonly injured foot bones in our study. Foot was often grossly twisted or crushed.

Head injury (65%) was most commonly associated with extremity injuries. However, this is more than 35% reported by Bartolomeo and Michelutto in their study of epidemiology of high grade trauma in 1999. This difference may be due to the inclusion of head injury patients without extremity injury in our study.

Limitation of study

Although it can be inferred that huge losses in productivity may incurred by accidents, we have not studied the actual economic impact of the same. Also, this study did not look at the differences in injuries sustained by the rider versus the pillion passenger and whether victims involved were using a helmet or not. Such information may be very useful in raising awareness about the importance of helmet use as well as for controlling the quality of head protective devices available in the market. Also, we have not looked at the length and cost of hospital stay as well as details of surgical management which can often be protracted and include multiple procedures. These may be directions for future research on this subject and may add valuable information to what previous authors and the present study have provided, to raise awareness and tackle the problem of RTA (road traffic accidents).

Conclusion

This study has shown that extremity injuries are common in polytrauma. Fractures associated with vehicular movement of people on our roads remains a significant problem in our environment, with motor vehicles accounting for most injuries. Our roads should be standardized and drivers made to obey all traffic laws, including good maintenance of their vehicles. We also need more

specialists in trauma management and government should improve on the existing health facilities available, creating more where possible. The public should also be educated on the need to attend these facilities on time when they have fractures. Regional trauma centers will be very useful in managing such injuries.

References

1. Burch J.M, Francois R. J, Moore E. E. Trauma. In: Eds, Schwartz S. I, Spencer F.C, Shires G.T.Principles of surgery.7th ed. McGraw Hill. 1999; 155-221
2. Litwin G.M. Trauma: Management of the acutely injured patient. In Ed. Davis-Christopher D.C. Sabiston textbook of surgery. 15th ed. Saunders 1997; 296
3. Murdock AD, Jenkins DH. (2010). Mass Casualties: Military and Civilian. In Damage Control Management in the Polytrauma Patient.2010; 367-402.
4. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study. Lancet 1997; 349(9064): 1498-504.
5. Pfeifer R, Tarkin IS, Rocos B, Pape HC. Patterns of mortality and causes of death in polytrauma patients—has anything changed?. 2009. Injury: 40(9): 907-911
6. Dang CV, Keenan MAE. The Polytraumatized Patient. Last Accessed July 16, 2013. <http://emedicine.medscape.com/article/1270888-overview>
7. Peden M, Scurfield R, Sleet D, et al. World report traffic injury prevention [R]. Geneva: World Health Organization, 2004:1-280.
8. Murray CJ, Lopez AD. Alternative projections of mortality and

- disability by cause 1990-2020: Global Burden of Disease Study. *Lancet* 1997; 349(9064): 1498-504.
9. West JG, Trunkey DD, Lim RC. Systems of trauma care: a study in two countries. *Arch Surg* 1979; 114: 455-60
 10. Wixted J.J, Reed M, Eskander M.S, Millar B, Anderson R.C, Bagchi K, et al. The effect of Orthopaedic trauma room on after hours surgery at a level one trauma centre. *J Orthop Trauma* 2008; 22(4):234-6
 11. Enweluzo G.O, Giwa S.O, Obadum D.C. Pattern of extremity injury in polytrauma in Lagos Nigeria. *Niger Postgrad Med J* 2008; 15(1): 6-9.
 12. Menon A, Pai V.K, Rajeev A. Pattern of fatal head injuries due to vehicular accidents in Mangalore. *J Forensic Leg Med* 2008; 15(2):75-7
 13. Osime O.C, Ighedosa S.U, Oludiran O.O, Iribhogbe P.E, Ehikhamore E, Elusoji S.O. Pattern of trauma deaths in an accident and emergency unit. *Prehosp Disaster Med.* 2007; 22(1):5-455-60
 14. Nantulya VM, Reich MR. The neglected epidemic: road traffic injuries in developing countries. *BMJ.* 2002; 324: 1139-1141.
 15. BK Prasad, C Prasad. Road traffic accident (R.T.A) as major killer: a report on medicolegal autopsies in Bharatpur hospital. *Kathmandu University Medical Journal.* 2003; 1(1), 34-35.
 16. Jha N, Agrawal CS. Epidemiological Study of Road Traffic Accident Cases: A Study from Eastern Nepal, *Regional Health Forum* 2004; 8(1):15-22
 17. Rao D, Mukerjee S. A study of pattern of injuries in road traffic collisions. *Journal of Punjab Academy of Forensic Medicine & Toxicology;* 2010 (10).
 18. Ganveer GB, Tiwari RR. Injury pattern among non-fatal road traffic accident cases: A cross-sectional study in Central India. *Indian J Med Sci* 2005; 59:9-12.
 19. Ayeni O. causes of mortality in an African city. *Afr. J Med. Sci.* 1980; 9:139-144.
 20. Bakke HK, Hansen IS, Bendixen AB, et al. Fatal injury as a function of rurality-a tale of two Norwegian counties [J]. *Scand J Trauma Resusc Emerg Med* 2013; 21:14.
 21. Oluwadiya K.S, Oginni L.M, Olasinde A.A, Fadiora S.O. Limb injuries in a developing country. *West Afr. J. Med.* 2004; 23 (1): 42-47
 22. Helfet D. L, Howery T, Saunders R, Johansen k. Limb salvage versus amputation; preliminary report of the mangled extremity severity score. *Clin. Orthp.* 1990; 256:80-83