

Original Research Paper

Analyzing Pattern of Head Injuries Sustained by Patients due to fall from Height: A Prospective Study

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Abstract

We analyzed the pattern of head injuries in patients of fall from a height of 9-10 feet and aged 20-70 years. This prospective study was done at JNMCH, Aligarh, on 100 patients who sustained a fall and came to the casualty for treatment during a 12-month period i.e. from January 1, 2011 to December 31, 2011. Male: female ratio was 2.13:1. Maximum number of cases was in the age group of 30-40 years. Skull fractures were seen in 79 cases (79%) and intracranial injuries occurred in 87 cases (87%). The most common fracture was linear un-displaced fracture and was observed in 62 cases (62/79; 78.48%) and the most common intracranial injury was extra-axial bleed seen in 73 cases (73/87; 83.91%). Skull fractures and intracranial injuries were seen either alone or together. Fall related injuries can be prevented by avoiding excess alcohol intake and multiple self-medications without prescription during working at height, and by using appropriate footwear.

Key Words: Fall from height, Skull fracture, Extra-axial bleed, Contusion, Unprotected rooftops

Introduction:

One of the major causes of accidental injuries is fall from height and is responsible for many serious and fatal head injuries every year. Fall is an underlying cause of 10-15% of all emergency department visits and lead to 20-30% of mild to severe injuries. [1]

Falls can occur at any age and from any surface. The nature and magnitude of the injury in free falls depends upon height of fall, impact of surface, part of the body impacting, distribution of impacting forces, body mass and patient's age which affect tissue tolerance.

If the primary impact is on the head, then a massive skull fracture may occur. [2]

Many work activities involve working at height which includes working using ladders, stepladders, scaffolds, mobile-elevated working platforms and working at the rooftops.

As many workers are exposed to the hazards of fall daily, fall from height is an important topic for occupational safety and health services.

Material and Methods:

This study was carried out in Department of Forensic Medicine in collaboration with consultant in-charge of Neurosurgery and Casualty section of the hospital. It consisted of 100 cases of head injury due to fall from height in victims aged 20-70 years who came to the casualty of the JNMCH, Aligarh, for treatment between the period from January 2011 to December 2011.

The study was aimed at analyzing the pattern of head injuries sustained by fall from height of 9-10 feet and their relationship, if any, to age and gender.

The information about the patients admitted was obtained from the Department of Neurosurgery and then epidemiological features and injury characteristics were entered on a predesigned proforma, from the medico-legal case sheets of the patients prepared and maintained by the consultants concerned.

Head injury patterns were taken from the reports of non-contrast CT-scan head of the patients. We had not taken the cases of head injury due to fall from height who were either brought dead i.e. death on the spot or died on the way to hospital or were discharged from the casualty after providing first aid and those with incomplete or missing case sheets and LAMA or absconded cases.

Observations and Results:

In the present study on 100 cases of fall from height, it was observed that maximum

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number of the cases (30%) was of the age group 30-40 years. (Table 1) Most of the cases (66%) showed both skull fractures and intracranial injuries. (Table 2) Out of total 79 cases of skull fractures, linear un-displaced fracture (78.48%) was the most common skull fracture in this study. (Table 3)

The most common part of the skull bone fractured was parieto-temporal bone (n=21, 26.58%). (Table 4) Out of total 87 cases of intracranial injury, extra-axial bleed (n=73, 83.91%) which included both EDH and SDH was most commonly seen followed by contusion of brain seen in 46 cases (n=46, 52.87%) in present study. (Table 5)

Parieto-temporal lobe was the most common part of the brain injured. (Table 6) In our study most of the cases (n=85, 85%) were treated conservatively and 15% cases were treated surgically. (Table 7)

Discussion:

Fall from standing position can be a normal experience for anyone but fall from a significant height can be dangerous to almost every victim who falls either intentionally or accidentally.

In the present study of total 100 cases, the age of the victims varied from 20-70 years with a male: female ratio of 2.13:1 (68 males and 32 females) as seen in other studies. [3, 4]

The peak incidence was observed in the age group 30-40 years comprising 30% (30/100) of the cases which is in conformity to other studies. [3, 5] The reason was that mostly the injuries occurred at workplace and since it is a productive age group, most peoples fell either from unprotected rooftops of factories, motor vehicle workshops, or step ladders during painting walls. Those who undertake one-off jobs without proper training, planning or equipment also became the victims of fall. Male predominance is because of more exposure of men to outdoor activities.

Females mostly keep themselves indoor either due to cultural background or lack of employment so they are less prone to fall-related injuries but not completely spared from the risk of fall as mostly the roofs of houses at the place of study have no boundary walls.

In maximum number of the cases (66%) both skull fractures and intracranial injuries were seen. There were 79% cases of skull fractures with the linear un-displaced fracture and parieto-temporal bone (26.58%) being the most common skull bone fractured.

This occurred as during sudden and unexpected fall, victims tried to protect their

head from impact to the ground either through hand in front fall, back and elbow in back fall and from shoulders in side falls resulting in frontal bone fracture, occipital bone fracture and parieto-temporal bone fracture respectively due to impact of head on the ground due to inertia of fall. Depressed and comminuted depressed fractures were seen in 11 cases (11%) as their fall was arrested at some point by a projected surface or in cases that fell from stairs and the findings are consistent with other studies. [6-10]

Out of 87% cases of intracranial injuries, extra-axial bleed was the most common (83.91%) followed by brain contusion (52.87%) which is in accordance with other studies. [7, 11-13] Parieto-temporal lobe was the most common part of the brain injured showing 22 cases (22/73; 30.14%) of extra-axial bleed, 13 cases (13/46; 28.26%) of contusion and 8 cases (8/24; 33.33%) of subarachnoid bleed.

Both coup and contra-coup injuries were seen either alone or together. Parieto-temporal lobe coup injuries occurred beneath the site of impact and were usually associated with overlying fracture of the skull.

Most of the cases (85%) were treated conservatively and surgery was performed in 15% cases which are in conformity with other studies. [9, 11, 14, 15] Conservative treatment was provided to those who suffered only simple skull fractures without any associated intracranial hematoma or in cases of mild head injury and self-resolving hematoma.

The cases of depressed fracture in which depressed bone segment impinged on the brain surface and those with non-resolving progressive hematoma were treated surgically. The surgeries performed were craniotomy and elevation of depressed bone segment and craniotomy and evacuation of hematoma.

Conclusion and Recommendations:

This study showed that no age group from adult to old age was spared from the risk of fall related head injuries. As males were more commonly affected than females, economic condition of the families was affected due to the injuries suffered by the earning member of the family. A wide range of skull fractures along with intracranial injuries were seen.

Linear un-displaced fracture of the parieto-temporal bone and extra-axial bleed and contusion of parieto-temporal lobe were the most common injuries. At the time of discharge there was no any neurological deficit in any patient who was treated either conservatively or surgically. From the present study it was concluded that intracranial injuries and skull

fracture can occur as a solitary finding in the absence of each other but the presence of skull fracture increases the chances of intracranial injuries. Falls can be prevented by taking certain precautions both at home and at workplace.

This can be done by reducing certain socio-economic risk factors like adequate housing, protection of rooftops with boundary walls, increasing awareness in the public regarding risk factors and hazards of fall by education and mass campaigns, by reducing environmental risk factors as well-planned building design, sufficient lighting, non-slippery floors and stairs.

There should be proper guidelines for workers working at a height. Fall related injuries can be prevented by avoiding excess alcohol intake and multiple self-medications without prescription during working at height.

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Table 1: Distribution of Age

Age (years)	Cases
20-30	21
30-40	30
40-50	25
50-60	12
60-70	12
Total	100

Table 2: Pattern of Head Injuries

Head injuries	Cases	
	No.	%
Skull fracture	13	13
Intracranial injury	21	21
skull fracture + intracranial injury	66	66
Total	100	100

Table 3: Skull Fractures

Type of Skull Fracture	Cases	
	No.	%
Linear un-displaced fracture	62	78.48
Comminuted fracture	6	7.59
Depressed fracture	3	3.80
Comminuted depressed fracture	8	10.13
Total	79	100

Table 4: Part of Skull Bone Fracture

Bones of Skull Fractured	Cases	
	No.	%
Frontal bone	13	16.46
Parietal bone	15	18.99
Temporal bone	13	16.46
Occipital bone	5	6.33
Frontal bone + Parietal bone	12	15.19
Parietal bone + Temporal bone	21	26.58
Total	79	100

Table 5: Scalp and Intracranial Injuries

Head injuries	Cases	
	No.	%
Scalp hematoma	87	87
Scalp laceration	10	10
EDH + SDH	73	83.91
Subarachnoid bleed	24	27.59
Contusion of brain	46	52.87
Cerebral oedema	13	14.94
Pneumocephalous	8	9.20

Table 7: Treatment

Treatment	Cases	
	No.	%
Conservative	85	85
Operative	15	15
Total	100	100

Table 6: Part of the Brain Showing Intracranial Injuries

Part of the brain	Intracranial Injuries Cases		
	Extra-axial bleed (EDH + SDH)	Subarachnoid bleed	Contusion of brain
Frontal lobe	10	3	6
Parietal lobe	15	4	9
Temporal lobe	12	5	12
Occipital lobe	3	1	2
Fronto-parietal lobe	11	3	4
Parieto-temporal lobe	22	8	13
Total	73	24	46