

ORIGINAL RESEARCH

Assessment of patterns of head injury caused by falling from heights

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ABSTRACT

Background: Injuries resulting from falling from heights can vary widely depending on several factors, including the height of the fall, the surface landed on, and how the body impacts that surface. The present study was conducted to assess patterns of head injury caused by falling from heights. **Materials & Methods:** 56 deceased of both genders were recruited for the study. For head injuries, on dissection of head, scalp, dura, vault, and base of skull were examined. Brain was dissected carefully to look for all kind of haemorrhages. **Results:** Out of 56 patients, males were 26 and females were 30. Head injury was scalp contusion in 14, skull fracture in 25, base of skull fracture in 16, brain laceration in 5, intracranial haemorrhage in 41, and facial bone fracture in 13 patients. Intracranial haemorrhage was sub dural haemorrhage (SDH) in 2, SDH+ subarachnoid haemorrhage (SAH) in 51, SDH+SAH+ extra dural haemorrhage (EDH) in 2 and SAH+SDH+EDH+ intra cerebral haemorrhage (ICH) in 3 patients. Spinal injuries included lumbar in 2, multiple in 7, sacral in 5, thoracic in 11 and cervical in 9 patients. The difference was significant ($P < 0.05$). **Conclusion:** When people fall from heights, the most common cause of death appears to be cerebral injuries, including subarachnoid and subdural hemorrhages.

Keywords: fall, heights, Head

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INTRODUCTION

Injuries resulting from falling from heights can vary widely depending on several factors, including the height of the fall, the surface landed on, and how the body impacts that surface. Head and brain injuries are among the most severe and potentially life-threatening.¹ They can include traumatic brain injury (TBI), skull fractures, and concussions. Head injuries can occur even if a person lands on their feet due to the force transmitted through the body upon impact. Spinal cord injuries can cause damage to the spinal cord, resulting in paralysis or other neurological deficits.² The severity depends on the location and extent of the injury. Fractures and broken bones such as the wrists, arms, legs, hips, and ribs may occur due to fall. The impact of the fall and how the body lands can determine which bones are affected. The force of impact from a fall can cause internal injuries such as organ damage, internal bleeding, or damage to blood vessels.³

Deceleration injuries to the intra-thoracic and inter-abdominal structures are common, particularly in cases where these structures are attached and generally immovable.⁴ For instance, the mesenteric

arteries and the aortic root. Major weight-bearing structures are affected by vertical deceleration injuries, which entail forces that travel through the foot, leg, pelvis, and spinal column. Age-specific fall mechanisms and injury patterns also exist.⁵ For example, falls at home tend to decrease with age, but falls at sports, schools, colleges, and recreational events, as well as road traffic incidents, tend to increase with age. The most frequent sort of playground-related injury is a fracture, which occurs when a child falls to the ground.⁶ The present study was conducted to assess patterns of head injury caused by falling from heights.

MATERIALS & METHODS

The present autopsy study was conducted on 56 deceased of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. The nature of fall, site of primary impact, nature of floor on which they fall, height from which they fall, period of survival etc., was recorded. Autopsy was conducted by Letulle's method of an en masse removal of

viscera and dissection of organs. For head injuries, on dissection of head, scalp, dura, vault, and base of skull were examined. Brain was dissected carefully to look

for all kind of haemorrhages. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 56		
Gender	Males	Females
Number	26	30

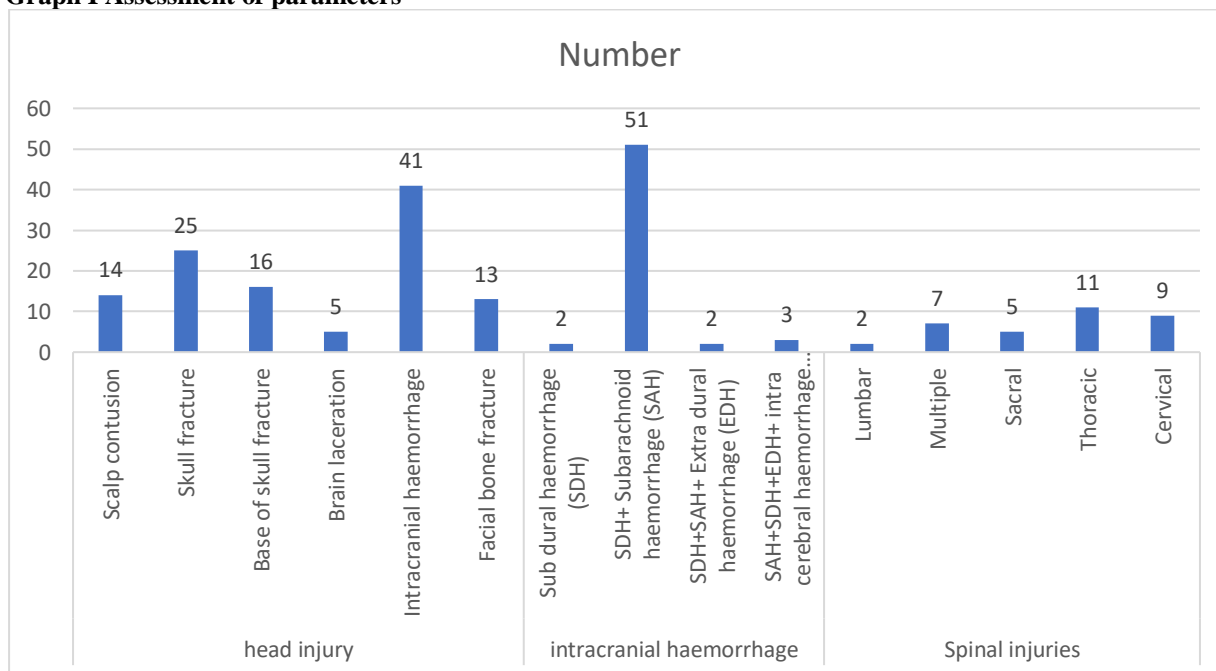
Table I shows that out of 56 patients, males were 26 and females were 30.

Table II Assessment of parameters

Parameters	Variables	Number	P value
head injury	Scalp contusion	14	0.05
	Skull fracture	25	
	Base of skull fracture	16	
	Brain laceration	5	
	Intracranial haemorrhage	41	
	Facial bone fracture	13	
intracranial haemorrhage	Sub dural haemorrhage (SDH)	2	0.01
	SDH+ Subarachnoid haemorrhage (SAH)	51	
	SDH+SAH+Extra dural haemorrhage (EDH)	2	
	SAH+SDH+EDH+ intra cerebral haemorrhage(ICH)	3	
Spinal injuries	Lumbar	2	0.75
	Multiple	7	
	Sacral	5	
	Thoracic	11	
	Cervical	9	

Table II shows that head injury was scalp contusion in 14, skull fracture in 25, base of skull fracture in 16, brain laceration in 5, intracranial haemorrhage in 41, and facial bone fracture in 13 patients. Intracranial haemorrhage was sub dural haemorrhage (SDH) in 2, SDH+ subarachnoid haemorrhage (SAH) in 51, SDH+SAH+ extra dural haemorrhage (EDH) in 2 and SAH+SDH+EDH+ intra cerebral haemorrhage (ICH) in 3 patients. Spinal injuries included lumbar in 2, multiple in 7, sacral in 5, thoracic in 11 and cervical in 9 patients. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

An injury sustained by a person after falling from a higher location—a ladder, scaffold, building, roof, or other elevated site or work area—is known as a fall from height (FFH).^{7,8} When falls occur from heights, the pattern of injuries depends on a number of factors, including height, body weight, velocity, type of surface struck, body orientation at impact, and the elasticity and viscosity of the tissue in the body region in contact.⁹ Of these, the height of the fall is the primary determining factor.^{10,11} The present study was conducted to assess patterns of head injury caused by falling from heights.

We found that out of 56 patients, males were 26 and females were 30. Somasundaram et al¹² found that the maximum number of fall from height cases seemed to be from the age group of 31 years ~40 years (30%) and males contributed to a majority of these cases (90%). Amongst head injury cases, 82% of the cases had intracranial haemorrhage and 10% had facial bone fractures. In the 82% of cases, 76% of cases had both subarachnoid haemorrhage and subdural haemorrhage. Also, skull fracture was seen in 40% of the cases and the base of the skull fracture was noted almost equally in 37% of the cases. Injuries to head and cervical spine constituted to the salient features of primary head impacts, SAH alone is rare in such cases.

We found that head injury was scalp contusion in 14, skull fracture in 25, base of skull fracture in 16, brain laceration in 5, intracranial haemorrhage in 41, and facial bone fracture in 13 patients. Intracranial haemorrhage was subdural haemorrhage (SDH) in 2, SDH+ subarachnoid haemorrhage (SAH) in 51, SDH+SAH+ extra dural haemorrhage (EDH) in 2 and SAH+SDH+EDH+ intra cerebral haemorrhage (ICH) in 3 patients. Spinal injuries included lumbar in 2, multiple in 7, sacral in 5, thoracic in 11 and cervical in 9 patients. Thierauf et al¹³ examined 291 fatal fall cases that had undergone post-mortem examinations. These incidents mostly involve falls from a height (n = 123) and falls to the ground (n = 122). These are contrasted with lethal falls down stairs (n=46); only head injuries are included in the study. In ground-level falls, the pattern of injuries in falls while intoxicated is different from the pattern in falls without alcohol in the case history: all injuries are observed in victims at a higher relative frequency following alcohol consumption. Alcohol use prior to a height fall had no effect on the pattern of injuries; intracranial traumas are observed less frequently as height increases.

Lohanathan et al¹⁴ included 861 patients with a mean age was 36.2 (SD 20.8) years. A male predominance (74%) was noted. Majority of the patients, i.e., 62%, were triaged as priority 2, depending on the hemodynamic stability. Approximately a quarter (26%) sustained injury to the lower limbs with 18% sustaining spinal cord injury (SCI). Among the patients suffering SCI (35%), patients were further

categorized in the American Spinal cord Injury Association (ASIA) classification. New Injury Severity Score (NISS) was more than 8 in 47% of the total study population. Majority of the patients, i.e., 62%, were discharged stable from ED after primary care with a plan of follow-up in the outpatient department. One-third (30%) of the total patients required hospital admission and among them 20% of the patients had to undergo major surgical intervention. The rest were either discharged stable or left against medical advice (LAMA) after primary care. The in-hospital mortality rate was 1.04%. This study has expressed the pattern of injuries in patients with FFH. An alarmingly high number of young adults with significant lower limbs and spinal injuries were noted. They observed that with increase in fall height there was a proportional increase in SCI and decrease in lower limb injuries.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that when people fall from heights, the most common cause of death appears to be cerebral injuries, including subarachnoid and subdural hemorrhages.

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