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PROSPECTIVE STUDY OF GERIATRIC HEAD INJURYAND OUTCOME – AN INSTITUTIONAL EXPERIENCE

Neurosurgery

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ABSTRACT

Introduction: Elderly trauma patients present unique challenges and face more significant obstacles in recovery than their younger counterparts. They usually experience higher morbidity and mortality and slower recovery trajectories and have, on average, worse functional, cognitive, and psychosocial outcomes months or years post-injury than do younger patients. **Methods:** The study is based on prospective observational type of study. We conducted a study of elderly head injury patients admitted to our unit in last 2 years in our institute. **Results:** Out of 200 patients, 69.5%males and 30.5% female. Road traffic accidents constitutes the principle mode of injury (57.5%) followed by fall (34%). RTA patients were common in 60-70 age group.We analyzed all the cases for surgical intervention after careful assessment of neurological condition. 57% patients were managed conservatively and 43 % patients were operated. Patients were good recovery was seen in 89.5 % and mortality in 10.5%. We also observed that associated comorbidities had adverse impact on outcome of patients. Patients were either not taking medication or irregular taking medication. Only 19.23 % of hypertensive and 16.66 % diabetic patients were strictly taking medications. Patients with deranged blood parameter (platelate count, INR, RFT, LFT,haemoglobin) need to be optimized and challenge during the treatment. **Conclusion:** Possible risk factors associated with deaths are identified in our population. More research is needed to develop specific management and preventive protocols.

KEYWORDS

Aged Population, Elderly Trauma, Geriatric, Head Injury, Outcome

INTRODUCTION

Traumatic brain injury (TBI) is a global health concern and is one of the leading causes of chronic disability and death worldwide. Traumatic brain injury (TBI) is common, affecting approximately 10 million people annually worldwide.[1] It is projected that the number of individuals 65 years old and above will reach 71 million in 2030 (U.S. Census Bureau, 2009), and in 2050 it is projected that there will be approximately 88.5 million elderly individuals in the U.S. (which would be about double what the elderly population was in 2010; Vincent and Velkoff, 2010). There is a significant increase in geriatric population at global level and at present constitute approximately 15%of the population of developed countries like U.K.[2] In India drastic improvements in public health and medical advance in the prevention of many diseases has led to increase in percentages of aged population. In India, 6.63% of the total population above 60 in developing countries[3]. The effect of head injury is disproportionately severe in elderly and for a given severity of head injury, more patients require admissions and neurosurgical care[4]. In western countries, elderly or geriatric is generally defined as aged 65 years and older. In developing countries like India, geriatric population is considered as 60yrs and older. Age is a strong factor influencing both mortality and morbidity following TBI and has been shown to be linearly associated with poor outcome. Falls may have replaced motor vehicle accidents as the primary mechanism of injury (Masson et al., 2001; Thurman et al., 1999).

In a nation-wide study of older adults admitted to UK hospitals for TBI, 11% had pre-existing dementia, 22% had preexisting hypertension, and 99% had at least one pre-existing medical condition.[5] Those with one pre-existing condition often had additional co-occurring conditions, such as diabetes, cardiovascular disease, pulmonary disease, or renal disease.[6,7] Geriatric trauma patients have a higher incidence of pulmonary and infectious complication than the younger patients.[8]

We conducted a study of 200 cases of geriatric population (age >60 yrs) who were admitted to our department with head injury in a span of 2 years from January 2020 to January. 2022.

AIMS AND OBJECTIVES

1 To study the patients (>/= 60 yrs) regarding age, sex , mode of injury
2 To study effect of asscociated age related comorbidity like hypertension, diabetes mellitus, coagulation profile, cerebrovascular accidents , cataract, hip and knee diseases, cervical spondylosis, vertigo on outcome
3 To study the CT finding and operative procedures performed.
4 To study the outcome of the patients in terms of GCS on admission , on discharge

MATERIAL AND METHODS

Patients of head-injury aged 60 and above who will be admitted from January 2020 to January 2022 in trauma hospital, SMS will be included in the present study. The following information will be obtained regarding age, sex, mode of injury, other associated injuries, other health co-morbidity, Glasgow Coma Score (GCS) on admission and on discharge, drug intake history , vitals, blood profile include all routine investigation, BT,CT, PTINR, Computer Tomography (CT) finding, MRI BRAIN in patients where CT head appears to be normal(like in patients with diffuse axonal injury) where severity of head injury (GCS<8) cannot be explained on basis of CT scan head , whether surgery performed or managed conservatively . Comatose patients with severe head injury will be treated in the intensive care unit.

Inclusion criteria:

All the patients admitting in Sawai Man Singh hospital, Jaipur aged more than 60 yrs.

Exclusion criteria :

All patients with age <60 years were excluded. Also, the patients who could not be revived and died in the casualty itself before admission to either the ICU or ward were excluded from the study. The time period of the study was a period of 2 years from January 2020 to January 2022. The study population was all elderly people (>= 60 years) who presented to these department of neurosurgery after a head injury

RESULTS :

AGE:

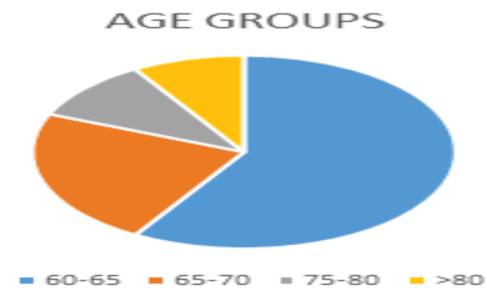


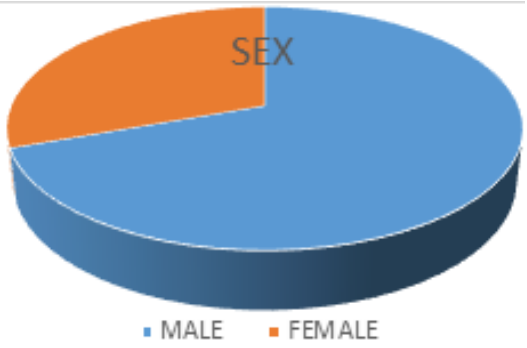
Fig 1 No. of patients with head injury and age group.

Maximum number of patient was found in 60-65 years age groups (57.5%) followed by 65-70 years age groups (22.5%), 70-75 years age groups (10.5%), 75-80 years age groups (6%) and >80 years age groups (3.5%)

GENDER

Male was 69.5% and female was 30.5%.

Fig 2.0 Gender Distribution



Mode of injury

Chart :1 types of modes of injury

	Frequency	Percent
-	2	1.0
ASSAULT	15	7.5
FALL	46	23.0
FFH	22	11.0
RTA	115	57.5
Total	200	100.0

RTA was present higher 57.5% followed by fall (23%) and FFH (11%) With 1 % patient with unknown etiology.

Diagnosis

Chart: 2 diagnosis as CT scan finding

	Frequency	Percent
Depressed fracture	8	4
Contusion and acute SDH	95	47.5
EDH	20	10
Chronic SDH	74	37

Depressed fracture was found in 4% patients, contusion was found in 47.5% patients, EDH was found in 10% patients and SDH was found in 37% patients.

TREATMENT

Chart 3: Management

	Frequency	Percent
CONSERVATIVE	114	57.0
OPERATIVE	86	43.0

Procedure

Chart 4 : types of surgeries performed

	Frequency	Percent
Decompressive Craniectomy	18	20.93
Craniotomy	22	25.58
Depressed fracture	13	15.11
Shunt	3	3.4
Burr hole	30	34.88

Most common surgery performed burr hole for chronic subdural haematoma 34.88 %. Craniectomy was done in 20.93% patients, craniotomy was done in 25% patients, Depressed fracture was done in 15.11% patients. 3 patients underwent shunt procedure for posttraumatic hydrocephalus.

Injury

Chart 4:

	Frequency	Percent
Long bone	12	6
Chest and abdominal	6	3

Long bone was present in 6% patients and chest and abdominal injury was present in 3% patients

Associated Co morbidity

Chart: 5

	Frequency	Percent
NAD (no associated co-morbidity)	99	49.5
CAD (coronary artery diseases)	12	6
DM (diabetes mellitus)	12	6
HT (hypertension)	52	26
RA(rheumatoid arthrities)	6	3
Cataract	9	4.5
Lung diseases (asthma, COPD, bronchitis etc)	31	15.5

BLOOD PROFILE

PLATELET

Chart: 6

	Frequency	Percent
Deranged	14	7.0
WNL	186	93.0
Total	200	100.0

INR

Chart :7

	Frequency	Percent
Deranged	84	42.0
WNL	116	58.0

LFT

Chart :8

	Frequency	Percent
DERANGED	5	2.5
WNL	195	97.5

RFT

Chart:9

	Frequency	Percent
DERANGED	13	6.5
WNL	187	93.5

Mortality

Chart: 10

	Frequency	Percent
Alive	179	89.5
Death	21	10.5
Total	200	100.0

Death was present in 10.5% cases.

Mortality and age groups

Chart 11

	Age groups	Total					
	60-65	65-70	70-75	75-80	>80		
Mortality	Alive	N	103	41	19	10	6	179
		%	57.5%	22.9%	10.6%	5.6%	3.4	100.0
	Death	N	12	4	2	2	1	21

		%	57.1%	19.0%	9.5%	9.5%	4.8%	100.0%
Total	N	115	45	21	12	7	200	
	%	57.5%	22.5%	10.5%	6.0%	3.5%	100.0%	

Mortality has showed in only 60-65 years (57.1%) and 65-70 years (19.0%) and 70 and above (23.8%) age groups.

Mortality and gender

Chart: 12

			Gender		Total
			F	M	
Mortality	Alive	N	55	124	179
		%	30.7%	69.3%	100.0%
	Death	N	5	16	21
		%	23.8%	76.2%	100.0%
Total		N	60	140	200
		%	30.0%	70.0%	100.0%

Higher mortality was showed in male (76.2%) as compared to female (23.8%) .

Mortality and mode of injury

Chart:13

	MODE OF INJURY							Total
			-	ASSAUL	FALL	FFH	RTA	
Mortality	Alive	N	2	14	44	20	104	179
		%	1.1%	7.8%	24.58%	11.17%	58.1%	100.0%
	Death	N	0	1	2	3	15	21
		%	0.0%	4.7%	9.5%	14.28%	71.42%	100.0%
Total		N	2	15	46	22	115	200
		%	1.0%	7.5%	23.0%	11.0%	57.5%	100.0%

71.42 % patients died due to RTA , 14.28 due to fall from height, 9.5% due to spontaneous fall, 4.7% due to assault.

Age and mode of injury

Chart :14

	mode of injury							Total
			-	ASSAULT	FALL	FFH	RTA	
Age groups	60-65	N	2	8	25	5	75	115
		%	1.7%	7.0%	21.7%	4.3%	65.2%	100.0
	65-70	N	0	5	7	10	23	45
		%	0.0%	11.1%	15.6%	22.2%	51.1%	100.0
	70-75	N	0	1	11	3	6	21
		%	0.0%	4.8%	52.4%	14.3%	28.6%	100.0
	75-80	N	0	1	2	2	7	12
		%	0.0%	8.3%	16.7%	16.7%	58.3%	100.0
	>80	N	0	0	1	2	4	7
		%	0.0%	0.0%	14.3%	28.6%	57.1%	100.0
Total		N	2	15	46	22	115	200
		%	1.0%	7.5%	23.0%	11.0%	57.5%	100.0

P value=0.02 (S)

Age and GCS at admission

Chart 15: GCS and various age group

	Admission					Total
			Mild (14-15)	Moderate (9-13)	Severe (3-8)	
Age groups	60-65	N	30	28	57	115
		%	26.1%	24.3%	49.6%	100.0%
	65-70	N	8	15	22	45
		%	17.8%	33.3%	48.9%	100.0%
	70-75	N	4	6	11	21
		%	19.0%	28.6%	52.4%	100.0%
	75-80	N	2	4	6	12
		%	16.7%	33.3%	50.0%	100.0%
	>80	N	1	5	1	7
		%	14.3%	71.4%	14.3%	100.0%
Total		N	45	58	97	200
		%	22.5%	29.0%	48.5%	100.0%

GCS

Chart 16: admission and discharge with respective GCS

	Admission		Discharge	
	Frequency	Percent	Frequency	Percent
Mild(13-15)	45	22.5	38	21.2
Moderate(9-12)	58	29.0	52	29.1
Severe (8 or less)	97	48.5	89	49.7
Total	200	100.0	179	100.0

P value=0.001 (S)

At admission, severe GCS (48.5%) was present than moderate (29%) and mild (22.5%)
At discharge, severe GCS (49.7%) was present than moderate (29.1%) and mild (21.2%)

Mortality

Chart17: mortality with GCS on admission

		Admission			Total
		Mild (14-15)	Moderate (9-13)	Severe (3-8)	
Death	N	3	6	12	21
	%	14.28%	28.5%	57.14%	100.0%

Out of 21 death cases, 12 case have severe score, 3 case have mild score and 6 case have moderate score.

DISCUSSION

TBIs in old aged vary from countries to countries. This study underscores the impact of traumatic brain injury on geriatric patients. Also highlights the associated comorbidities in geriatric patients.

In our study, higher 57.5% patients were found in 60-65 years age groups followed by 66-70 years, 22.5% patients and 71-80 years, 16.5% patients and above 80 yrs,3.5 % patients. 69.5% patients were male and 30.5% patients were female. Fall (23%) and RTA (57.5%) were higher in the study. A study by Munivenkatappa et al (2017), 71% were male and 29% females. Falls were major cause (53%) followed by RTAs (30%).9 According to Nagocha VB (2019) et al, 68% (n=75) of the patients were male and 32% females. Patients in the age group of 60-65 years were 60.9%, 66-70 years were 20.9% and more than 70 years of age were 18.2%. Fall (50.9%) and RTA (45.45%) were common.10 Fall is one of the leading cause of traumatic brain injury (TBI) of older patients (51%) and motor vehicle traffic accident are second (9%).11

In the present study, RTA was the most common cause of head injury constituting about 57.5 % of the patients, fall and fall from height (FFH) was the second most common with 34 % of patients, 7.5% patients were having head injury due to assaults, 1 % patients with unknown etiology. RTA was the most common among all age group above 60 except 70-75 years in which spontaneous fall and fall from height most common. But still number of spontaneous fall and fall from height was increased in patients above 65 yrs. In our present study, we found more number of patients (57.5%) due to RTA as comparable to falls.

GCS is the most widely used tool for the clinical assessment to determine the severity of TBI at presentation. However, it may lack the nuance required to accurately assign TBI severity in older adults. Pre-existing dementia, comorbid conditions and medication side effects can confound the accurate GCS and patients may have an abnormal GCS at baseline.10 In present study, At admission, severe GCS (GCS less than 8) was present in 48.5 % of the patients; moderate GCS (GCS: 9-12) was present in 29% of the patients and mild GCS (GCS13-15) was present in 22.5% of the patients. . In present study, 49.7% patients were discharged with severe GCS, 29.1% patients discharged with moderate GCS and 21.2% with mild GCS. In study by Nagocha VB (2019) et al, 36.36% of the patients presented with GCS in range of 13-15, 40.9 % in the range of 9-12 and 22.72 % with GCS of 8 and below. In study by Dr. V. D. Sinha et al, 44% of the patients had initial GCS between 13-15 on admission, 25.9% patients 9-12 while 30% patients had GCS 8 or below on admission. Highest mortality 67.8% was seen in patients with GCS of 8 or below and mortality was 15.8% in patients with GCS 9-1212. It was found that mild to moderate GCS was more in age group 60-70yrs at the time of admission and at discharge there was more fall in GCS in patients above 70 yrs of age than between between 60-70yrs. It was observed that there was increase in number of patients with severe GCS at the time discharge. As during hospital stay,

geriatric patients mainly had problems like tongue fall, increased secretion that patients were unable to clear, early lung infections so there were many patients who underwent tracheostomy. Total 30 patients (15%) underwent tracheostomy.

In the present study, Long bone injury was present in 6% patients and chest and abdominal injury was present in 3% patients. All the patients with abdominal injury were having 100% mortality rate. Chest injuries present in the patients includes single rib fracture, multiple rib fracture associated with/without pneumothorax, haemopneumothorax requiring urgent intercostal drainage insertion. Most of the Abdominal and chest injuries were present in patients with road traffic accidents. 4 patients (2%) were having spine injury. 2 patients having combined cervical and lumbar fracture. 2 patients having lumbar fracture. 3 out of 4 patients having history of fall from height and 1 patient with RTA.
Biologically, with aging, white matter and vasculature become more susceptible toinjury,13,14 injury response mechanisms such as autophagy are dampened,15 and prevalence of pre-existing neurological or systemic comorbidities increases.16 Unsurprisingly, older adults with TBI slower recovery trajectories 17-20 and have, on average, worse functional, cognitive, and psychosocial outcomes months or years post-injury than do younger patients. 17,20-23 These patient suffer adverse outcomes from surgery as a result of medical complication. Symptoms of orthostasis and the presence of comorbidities such as polyneuropathy, vision impairment, or benign paroxysmal positional vertigo must also be considered and addressed. Home assessment and modifications may be indicated near the time of discharge24.In the study, Hypertension was present in (n-92) 46% patients and already known cases of Hypertension were (n- 52) 26%. So 40 patients were newly diagnosed hypertensive. Coronary artery disease were present in 6% of the patients, 6% patients were diabetic, cataract was present in 4.5% of the patients, pulmonary diseases which include COPD ,asthma, bronchitis were present in 15.5% of geriatric patients, rheumatoid arthritis was present in 3% of the patients. 19.23% patients were taking antihypertensive medications and rest of the k/c/o hypertension patients were either not taking medication or on irregular medication. Among coronary artery disease patients, 66.66% of the patients of k/c/o coronary artery disease or cerebrovascular accidents were taking antiplatelet and anticoagulants medication. Only 16.66% of the diabetic patients were taking antidiabetic medication.

Older adults are frequently are associated with comorbidities; many have indications for anticoagulation and antiplatelet agents. Where head injury arises from falls in the context of anticoagulants or antiplatelet agents, haemorrhagic complications may be as high as 15.9%5.Patients with TBI who are on anticoagulants have a two to six times greater mortality.18 7% patients where having low platelet counts (<1lac), 42% of patients having deranged INR (INR- 1.6 or above)2.5% of the patients were having deranged Liver Function TestS , 6.5 % patients having deranged Renal Function Tests.

Plain CT head is the most common and important diagnostic tool in evaluation and management of head injury.25 The types of pathologies seen on CT head differ by age: Prevalence of extradural hematoma declines with age whereas prevalence of subdural hematomas increases with age.26 In our study, all patients were underwent CT scan head and in 2 patients with normal brain CT scan, MRI brain was also done.

Apart from chronic subdural hematoma however a head injury is much more likely to give rise to intracranial bleeding or a cerebral contusion in an elderly. One exception to this rule is extradural hemorrhage which is relatively rare in elderly, probably because the dura becomes more adherent to the inner table of the skull with increasing age 27,28,29. In the present study, more number patients were found to have contusion and SDH. With contusion in 47.5 % and SDH in 37% patients. Contusion include unilateral, bilateral, single and multiple contusions and haematoma.3 patients were having brain stem contusion. 2 patients were having diffuse axonal injury. Many patients were having combined SAH, contusion and SDH. Depressed fracture was found in 4% patients. EDH was found in 10% patients. The Study by Nagocha VB (2019) et al, Chronic SDH was the most common pathology seen in 36.45 % patients and brainstem contusions being the least common seen in only 2.72 % patients. Acute SDH was seen in 16.36 % and Contusions were seen in 11.8% of patients. in 13.2% patients.10 In study by Dr V. D. Sinha et al, Chronic subdural hematoma was the most common intracranial pathology found in 20% of the patients. Contusions seen in 19.3% and multiple intracranial hematoma in 13.2% patients, Brain stem contusions and diffuse axonal injuries in 4.2% patients and EDH in 3.5% cases.12

In current study, 57% of the patient were treated conservatively 43% patient were operated. Elderly patients can often harbor large mass lesions with relatively little mass effect because of the extra space provided by atrophy. Most common surgery performed burr hole for chronic subdural haematoma 34.88 %. Craniectomy was done in 20.93% patients, craniotomy was done in 25% patients, Depressed fracture was done in 15.11% patients. 3 patients underwent shunt procedure for posttraumatic hydrocephalus. Despite the availability of consensus recommendations, elderly individuals are less likely to have neurosurgical intervention than younger patients with equal damage. This may be because elderly people treated surgically have poor results. In one research, survival after surgical intervention for traumatic brain injury was 59.3 percent for ages 65–74 and just 32.4 percent for those aged over 75. Debate exists concerning the advantages and function of decompressive neurosurgery in the elderly patient with haemorrhagic consequences of head injury. This is confounded by issues interpreting the research since it is known that older individuals tend to tolerate more severe intracranial damage before reflecting the degree of their injury in their GCS. Adverse outcomes in elderly patients with comparable GCS to younger individuals may thus imply more severe damage and unfair comparison.30,31

In the present study, Higher mortality was showed in male (76.2%) as compared to female (23.8%) which was non-significant. Jamjoon D et al reported no significant difference to outcome with respect to sex but significantly poor outcome in the older patients of head injury.32 Road traffic accidents accounts for a high proportion of the most serious head injuries amongst the elderly (Jamjoon D et al), as in the study by Sinha VD, mortality rate was 27.5% in cases of RTA, 24% in cases of fall while it was 23.5% in assault.12 The elderly with TBI on an average has slow rates of cognitive and functional recovery, worse functional outcomes and higher mortality rates when compared to their younger counterparts.33 Also very old age and CT evidence of brainstem or diencephalic injury are associated with poorer outcomes. The mechanism of injury and GCS may be however less important predictors.34 Careful patient selection, good pre-injury health status and aggressive treatment for such patients have been associated with lower short-term mortality among the elderly.35 In the current study, mortality was seen in 57.14 % of patients with severe GCS, 28.5 % with moderate GCS, 19.28% with mild GCS with total 21 patients died during the study. 71.42 % patients died due to RTA , 14.28 due to fall from height, 9.5% due to spontaneous fall, 4.7% due to assault. 76.2% were male and 23.8% were female. In the study by nagocha et al, The mortality rate increased with age: the highest mortality was observed in patients aged above 70 years (50%). Mortality rates were 22.2% in patients with age group of 66-70 years, while it was 27.8% in patients with age group of 60-65 years.10

Hypotension on arrival, intraventricular hemorrhage, subarachnoid hemorrhage, and useof antiplatelet agents further increase the risk of death.36 Resource utilization is higher in geriatric TBI because these patients require longer hospitalization, more home health visits, and other care in the first year after injury.37 Geriatric patients with TBI also have more respiratory complication and are more likely to be discharged to a nursing home.38
There are no evidence-based national or international consensus guidelines and management guidelines for acute inpatient management or long-term outpatient follow-up of older adults with TBI. This is, in large part, attributed to the paucity of dedicated Class I prospective clinical trials of treatments for older adults with TBI.39,40

CONCLUSION

Result of advances in radio-imaging, surgical technique, anesthesia and ICU care are responsible for better results in geriatric head injury. There has been a rise in the number of aged people around the globe as a direct result of the improved treatment choices. Therefore, the number of elderly people presenting to emergency departments with traumatic brain injuries is likewise on the increase. On multivariate analysis, advanced age, comorbidity, and injury severity were independent predictors of both falls and mortality among elderly adults with TBI. Prevention efforts should be targeted to the vulnerable demographics identified in this study and those with multiple medical comorbidities. In addition, inpatient hospital and long-term care

facilities should be prepared to manage the burgeoning population of older patients with more complex comorbidities.

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