

# Functioning of Neurotrauma Center in PGIMER, Chandigarh

Madhivanan Karthigeyan<sup>1</sup> Lomesh Shankarrao Wankhede<sup>1</sup> Apinderpreet Singh<sup>1</sup> Sushanta Kumar Sahoo<sup>1</sup>  
 Manjul Tripathi<sup>1</sup> Chandrashekhar Gendle<sup>1</sup> Raghav Singla<sup>1</sup> Ashish Aggarwal<sup>1</sup> Navneet Singla<sup>1</sup>  
 Manju Mohanty<sup>1</sup> Sivashanmugam Dhandapani<sup>1</sup> Pravin Salunke<sup>1</sup> Sandeep Mohindra<sup>1</sup> Rajesh Chhabra<sup>1</sup>  
 Manoj Kumar Tewari<sup>1</sup> Kajal Jain<sup>2</sup> Sunil Kumar Gupta<sup>1</sup>

<sup>1</sup>Department of Neurosurgery and Anesthesia, Post Graduate Institute of Medical Education and Research, Chandigarh, India

<sup>2</sup>Department of Anesthesia, Post Graduate Institute of Medical Education and Research, Chandigarh, India

**Address for correspondence** Sunil Kumar Gupta, MCh, Professor and Head, Department of Neurosurgery, Post Graduate Institute of Medical Education and Research (PGIMER), Sector 12, Chandigarh 160012, India (e-mail: drguptasunil@gmail.com).

Indian J Neurotrauma 2019;16:120–123

## Abstract

The Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh is an apex trauma center which delivers comprehensive care for neurotrauma patients from six major states of north and northwest India. Its neurotrauma services have steadily evolved over the years with the establishment of an advanced trauma center in the year 2011. This manuscript provides an overview pertaining to the development of the neurotrauma services in PGIMER since its inception, the current infrastructure and resources, functioning of the department, baseline epidemiological data of neurotrauma patients, and the future prospects.

## Keywords

- ▶ trauma
- ▶ head injury
- ▶ spinal injury
- ▶ neurotrauma

## History and Overview of the Department

The Postgraduate Institute of Medical Education and Research (PGIMER) was founded in 1962 with the vision of Sardar Partap Singh Kairon, the then Chief Minister of Punjab, supported by the first Prime Minister of India, Pandit Jawaharlal Nehru. PGIMER was initially created for the erstwhile state of Punjab, but was declared an Institute of National Importance in 1967 by an act of the Parliament of India. The Department of Neurosurgery formally came into existence in January 1962.

After some initial hiccups, the Department of Neurosurgery acquired a bed strength of 24 in 1970, although the requirement was for much more. Being the only center to provide holistic care to all patients, the workload of the Neurosurgery department steadily increased. Therefore, the provided bed strength was always inadequate and the patients were admitted to beds in other wards. A head injury unit was established in 1971, but with no separate beds. Later, two beds were allocated in the emergency surgical outpatient department for head injuries. As this was never sufficient, head injury patients had to be shifted to the main neurosurgery ward, leaving very few beds for routine surgeries. In the emergency department, 12 beds were allocated to neurosurgery in 1978, which was later increased

to a full-fledged trauma ward. An advanced trauma center (ATC) was the need of the hour and formally came into existence in 2011. All the trauma services were shifted to ATC from Nehru Hospital.

## Infrastructure, Staff, and Resources

The ATC provides comprehensive multidisciplinary care for the neurotrauma patients utilizing the services of allied clinical departments. The patients, especially the ones with polytrauma, are managed by the collective expertise of other departments such as surgery, orthopaedics, ophthalmology, otolaryngology, and plastic surgery. There is a separate facility of disaster ward to manage mass casualties as and when the circumstances demand. When the patients arrive in ATC emergency services, they are initially triaged and evaluated for associated injuries. The casualty area in the ATC has been allotted different areas with standard color codes. The initial resuscitation takes place in the red area and once they are stabilized, they are then transferred to yellow and green areas. The ATC has dedicated computed tomography (CT) and magnetic resonance imaging (MRI) machines scans installed to facilitate swift transfer of neurotrauma patients for relevant imaging.

The ATC complex has 14 beds allocated for neurosurgical patients, 2 operation theaters (OT) dedicated for neurosurgery, and a 12-bedded intensive care unit (ICU) to manage neurosurgical patients. The neurosurgery OTs run round the clock and are well equipped with state-of-the-art equipment such as C-arm, operating microscope, and high-speed drills to tackle the complete spectrum of cranial and spinal surgeries. At present, all kinds of traumatic brain and spinal injuries including complex spine cases that need spinal instrumentation are being performed at the ATC OT complex. Every day, ~15 to 20 patients of neurotrauma are received in ATC. Every month, ~120 cases of head/spinal trauma are being operated at the trauma center. Patients who need ventilation and/or have sustained polytrauma are transferred to ICU and managed in combination with a dedicated neuroanesthesia team. Every faculty in the department has been involved in the periodic clinical rounds and patient care in ATC emergency and inpatient ward. A trauma registry has been initiated for record maintenance of the basic clinicoepidemiological data of the neurotrauma patients.

## Neurotrauma Audit

The consolidated data of patients who were admitted in ATC at the PGIMER, Chandigarh, from January 2018 to October 2019 has been presented. During this period, there were 8,744 victims of neurotrauma which comprised of 7,837 cases of isolated head injury, 755 cases of isolated spinal trauma, and 152 cases of combined injury. Overall, this resulted in 7,989 and 907 patients managed for head and spinal injury, respectively. At admission, the following data were registered: baseline patient demography, pattern of referral systems, catchment area, mode of injury, and the time taken to arrive at our trauma services. The major types of injury on CT scans were also noted. Furthermore, the trauma registry was looked into identify the prevalence of risk factors for head injury such as nonusage of helmet/seat belt and/or alcohol influence. Based on the presenting Glasgow Coma Scale (GCS), head injury was classified into mild (GCS 13–15), moderate (GCS 9–12), and severe (GCS  $\leq 8$ ) category. For patients with spinal trauma, the injury was categorized based on location and neurological status at admission based on American Spinal Injury Association (ASIA) scale.

The neurotrauma victims were predominantly adults (82.6%) while pediatric cases (< 18 years) accounted for 17.4% of injuries (►Fig. 1). The major share of these patients was referral from different service areas especially the states of Punjab (40.8%), Haryana (22.2%), and Himachal Pradesh (19.8%) (►Fig. 2).

## Head Injury

The mean age of the patients in head injury patients was 34.4 years (median, 32; range, 1–95). The duration from the time of injury to arrival to hospital varied from 15 minutes to 150 days (mean, 38.2 hours, and median, 10 hours). ►Table 1 details the demographic data of patients with head injury. Nearly two-thirds of the patients (61.1%) sustained

injury secondary to road traffic accidents. Approximately half of the patients (47.8%) had mild head injury, 20.1% of the patients had moderate injury, while 32% showed severe injury (►Fig. 3). History of alcohol consumption was noted in 19.8% of the head injury victims. Among patients with two wheeler and four wheeler accidents, only 12.1 and 10.1% were wearing helmet and seat belt, respectively (►Table 2). The major types of injury on CT scan are summarized in ►Table 3. Operative intervention was needed in 25.7% of head trauma victims. The various indications and the type of procedures for the same have been summarized in ►Table 4. Overall, the in-hospital mortality rate for head injury was 18.6%.

## Spinal Injury

In patients with spinal injury, the mean age at presentation was 39.7 years (median, 39; range, 1–86) and the time taken to reach trauma services varied from 1 hour to 150 days (mean, 64.1 hours and median, 21 hours). The various locations of the injury are detailed in ►Table 5. Of these patients, 41.2% belonged to ASIA grade A, 9.4% were in grade B, 10.5% in grade C, 12% in grade D, and 26.9 in grade E. The procedures for unstable spinal injuries included anterior fixation, posterior fixation, and combined anterior and posterior stabilization (►Table 6).

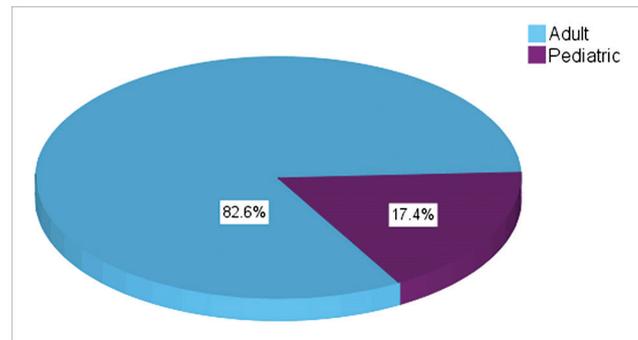


Fig. 1 Distribution of neurotrauma patients (adult vs. pediatric).

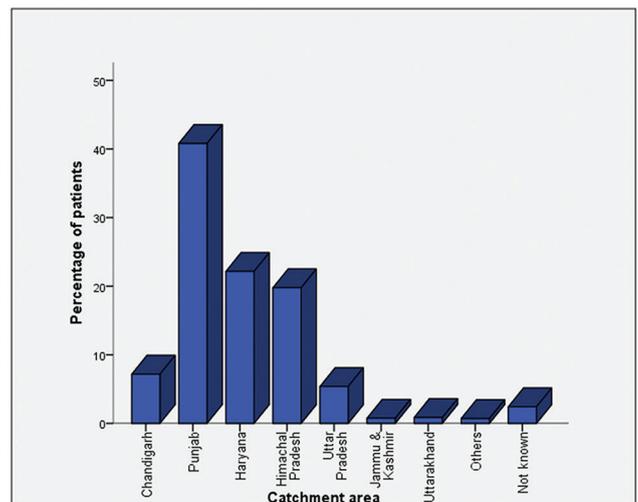
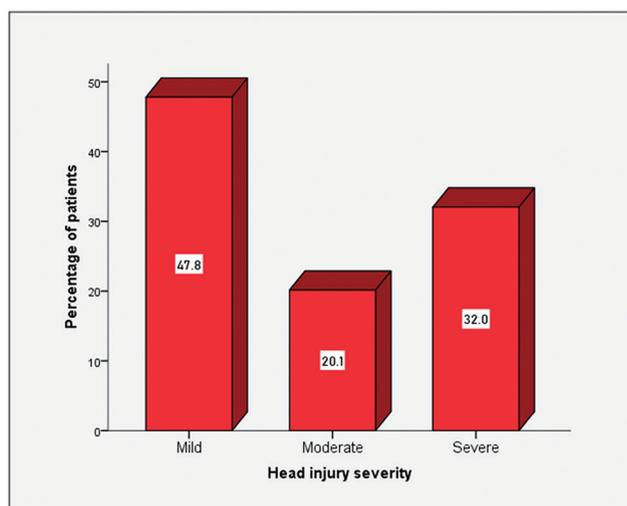


Fig. 2 Distribution of catchment areas of neurotrauma patients.

**Table 1** Baseline demographic data of patients with neurotrauma (January 2018–October 2019)

	Head injury		Spinal injury	
	n = 7,989	Percentage	n = 907	Percentage
<b>Age</b>				
Adult	6,510	81.5	851	93.8
Children	1,479	18.5	56	6.2
<b>Gender</b>				
Male	6,633	83	728	80.3
Female	1,356	17	179	19.7
<b>Referral pattern</b>				
Referred cases	7,295	91.3	828	91.3
Direct admission	694	8.7	79	8.7
<b>Referral sources</b>				
Chandigarh	579	7.2	54	6
Punjab	3,288	41.2	337	37.2
Haryana	1,798	22.5	169	18.6
Himachal Pradesh	1,535	19.2	241	26.6
Uttar Pradesh	413	5.2	65	7.2
Jammu and Kashmir	59	0.7	8	0.9
Uttarakhand	62	0.8	14	1.5
Others	44	0.6	17	1.9
Not known	211	2.6	2	0.2
<b>Mode of injury</b>				
Road traffic accident	4,881	61.1	337	37.2
Fall from height	1,600	20	382	42.1
Assault	396	5	19	2.1
Self-fall	647	8.1	99	10.9
Gun shot	7	0.1	3	0.3
Others	219	2.7	66	7.3
Not known	239	3	1	0.1

**Fig. 3** Distribution of patients according to the severity of head injury.

## Challenges Faced and Vision

Owing to an enormous patient load that we receive in our trauma center, there has always been a struggle to strike the right balance between the existing infrastructure and optimal patient management. Although our department strives to provide the best possible patient care, the demands have been steadily raising due to high inflow of patients. At times, the patients need to be triaged for ICU admissions and ventilatory beds. Furthermore, space constraint has been a constant concern in our largely populated setup. Also, the huge patient load prevents us from obtaining an exhaustive follow-up data of these neurotrauma patients.

## Future Plans

PGIMER has been allocated 50 acres of land for the construction of a new trauma center in the nearby Sarangpur area which is located ~2 km from the existing ATC complex. This, along with expansion of number of beds in trauma ward and

**Table 2** Usage of helmet/seat belt and alcohol influence in patients with head injury

Risk factor	n	Yes		No	
		N	Percentage	N	Percentage
Helmet usage <sup>a</sup>	3,321	403	12.1	2,918	87.9
Seatbelt usage <sup>b</sup>	593	60	10.1	533	89.9
Alcohol intake	6,657	1,319	19.8	5,338	80.2

<sup>a</sup>For two wheeler road traffic accidents.

<sup>b</sup>For four wheeler road traffic accidents.

**Table 3** Major pattern of head injury

Pattern	n = 7,989	
	N	Percentage
Extradural hematoma	1,215	15.2
Subdural hematoma	2,378	29.8
Contusion	3,790	47.4
Skull fracture	1,792	22.4

**Table 4** Management of patients with head injury

Management	n = 7,989	
	N	Percentage
Conservative	5,935	74.3
Operative		
Craniotomy and evacuation	341	4.3
Decompressive craniectomy	1,091	13.7
Wound debridement/ exploration	84	1.1
Burr hole and drainage	533	6.7
Others	5	0.06
ICU admissions	587	7.3

**Table 5** Level of injury and neurological status at admission in patients with spinal trauma

Location	n = 907	
	N	Percentage
Cervical	449	49.5
Thoracic	160	17.6
Lumbar	219	24.1
Multiple	79	8.7
<b>ASIA grade<sup>a</sup></b>		
A	374	41.2
B	85	9.4
C	95	10.5
D	109	12
E	244	26.9

<sup>a</sup>American Spinal Injury Association.

**Table 6** Management of patients with spinal trauma

Management	n = 907	
	N	Percentage
Conservative	453	49.9
Surgical		
Anterior fixation	190	20.9
Posterior fixation	259	28.6
Anterior and posterior fixation	5	0.6

ICU, would hopefully meet the existing lacunae in the current setup. The other aspect that needs to be built upon is the efficient referral systems so that the lag period to reach appropriate facilities (golden hour of trauma) is minimized to prevent potential secondary damage.

One of the future plan would be to increase staff (both medical and paramedical), periodic training programs for paramedical staff for better prehospital and primary in-hospital management. We plan to initiate dedicated head injury clinics for evaluation of the follow-up patients. The department of neurosurgery will soon be acquiring an endoscopic system for the trauma OT so that cases of traumatic cerebrospinal fluid rhinorrhea could be managed in trauma OT itself. An often-ignored aspect which needs attention is rehabilitative care of the head injured patients especially the moderate and severe head injured ones and their long-term outcome.