

Consciousness Disorders in Pedestrians Caused by Traffic Accidents

Yasuhiro Matsui, Shoko Oikawa, Sayaka Gomei

I. INTRODUCTION

Of all traffic-related fatalities in Japan in 2024 (2,663), pedestrian fatalities contributed the highest number (965, 36.2%) [1], with head injury being the most common cause of death [2]. Even for pedestrians who are not fatally injured in a traffic accident, head injuries may result in disorders of consciousness, making it difficult for the individual to continue normal social activities. This study aimed to clarify the relationship between head injury and disorders of consciousness in pedestrians transported to a medical emergency centre in Japan.

II. METHODS

Disorders of consciousness in pedestrians due to traumatic head injury were investigated based on emergency patient data from a Medical Emergency Centre (Saitama Medical Centre, Dokkyo Medical University, Japan), for the period from April 2011 to March 2014. Over these three years, this Centre accepted 362 emergency patients due to traffic accidents, with pedestrians accounting for 20% (n=72). Figure 1 shows the rates of injured and killed patients by accident type. Here, “injured” refers to both minor and serious injuries. Injured pedestrians accounted for 65% (n=47) of the patients. The study was approved by the Ethics Committee of Dokkyo Medical University Saitama Medical Centre.

We investigated pedestrians in the acute phase disorders of consciousness due to head injury when they were taken to the hospital by ambulance, and compared them with cyclists, from data in the literature [3], in order to characterise the pedestrians. Disorders of consciousness were indicated when any of the following five symptoms were described in their medical records: (1) higher brain dysfunction, (2) impaired cognitive function, (3) inability to express thoughts or to act smoothly, (4) being unconscious at the time of discharge (for transfer to another hospital), or (5) diffuse axonal injury. The Glasgow Coma Scale (GCS) was used as to quantify disorders of consciousness.

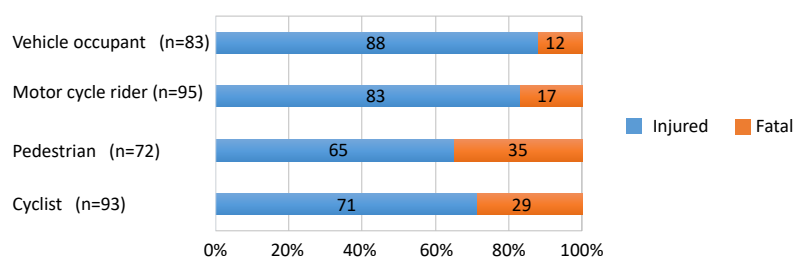


Fig. 1. Rates of patients injured and rates of patients killed, by accident category.

III. INITIAL FINDINGS

The rates of pedestrians and cyclists with head injuries did not differ significantly (pedestrians, 25/47, 53.2%; cyclists, 35/66, 53.0%; $P = 0.986$) (Table I).

TABLE I
RATES OF INJURED PEDESTRIANS AND CYCLISTS [3] WITH HEAD INJURIES

Type of road user	Injured [n]	Head injury		P-value*
		[n]	[%]	
Pedestrian	47	25	53.2	0.986
Cyclist [3]	66	35	53.0	

*Test for differences in population rates.

Y. Matsui (e-mail: ymatsui@ntsel.go.jp) is a principal researcher at National Traffic Safety and Environment Laboratory, Japan. S. Oikawa is a researcher at Tokyo Metropolitan University. S. Gomei is an emergency medical doctor and lecturer at Department of Emergency and Critical Care Medicine, Dokkyo Medical University Saitama Medical Centre, Japan.

Of the 25 pedestrians who suffered head injuries, six who had consumed alcohol or had dementia at the time of transport were excluded from this analysis. For the remaining 19 pedestrians with head injury, disorders of consciousness occurred in eight (42.1%; mean age, 65 years), whereas for the cyclists it occurred in 15 (46.9%; mean age, 38 years), with no significant difference in the rate ($P = 0.741$; Table II).

TABLE II
RATES OF PEDESTRIANS AND CYCLISTS [3] WITH DISORDERS OF CONSCIOUSNESS

Type of road user	Head injury ^{*1} (n)	Disorders of consciousness		P -value ^{*2}
		(n)	(%)	
Pedestrian	19	8	42.1	0.741
Cyclist [3]	32	15	46.9	

*1 Patients who had consumed alcohol or had dementia at the time of transport were excluded.

*2 Test for differences in population rates.

On the GCS, head injuries are defined as severe (GCS score ≤ 8), moderate (GCS score, 9–12), or mild (GCS score, 13–15) [4]. Of the eight pedestrians with disorders of consciousness, the largest rate (50.0%) had a GCS score ≤ 8 (Fig. 2).

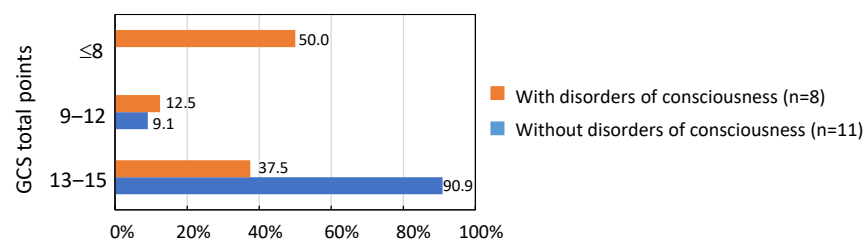


Fig. 2. Distribution of pedestrians according to Glasgow Coma Scale (GCS) categories, with and without disorders of consciousness. GCS score: ≤ 8 , severe head injury; 9–12, moderate head injury; 13–15, mild head injury.

IV. DISCUSSION

These findings do not indicate that pedestrians with worse head injuries were more likely to experience disorders of consciousness, suggesting that disorders of consciousness in pedestrians may not be predicted using the GCS score in the acute phase. Of the eight pedestrians with disorders of consciousness, 37.5% had mild head injuries, with GCS scores of 13–15, while 12.5% had moderate head injuries, with GCS scores of 9–12. This study examined data for 19 pedestrians with head injury. In future studies, larger samples of pedestrians should be used, to allow for greater precision.

Of the pedestrians who suffered head trauma, 42.1% experienced disorders of consciousness during the acute phase. Such disorders may make it difficult to continue engaging in social activities. Currently, there is no equipment, such as a bicycle helmet, that can protect a pedestrian's head during a collision. The ideal situation is to entirely avoid collisions between vehicles and pedestrians. Advanced vehicle safety systems using sensors could be used to prevent collisions and head injuries, by detecting pedestrians, reducing impact speeds, or entirely avoiding collisions. Such systems are likely to become widespread.

This study investigated disorders of consciousness in pedestrians during the acute phase, based on medical records at an emergency medical centre. After discharge, patients may start rehabilitation for symptoms related to disorders of consciousness, including problems associated with memory, attention, executive function, and social activity. Post-discharge follow-up surveys should be conducted to clarify changes and recovery in the patients who experienced disorders of consciousness.

V. ACKNOWLEDGEMENTS

This research was funded by the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT), Japan.

VI. REFERENCES

- [1] National Police Agency, Traffic Accident Status, 2025.
- [2] ITARDA, *Traffic Statistics*, 2024.
- [3] Oikawa, *et al.*, *J Biomech Sci Eng*, 2019.
- [4] Wells, A. J. and Reilly, P. L., *J Clin Sci*, 2025.