イタルダ インフォメーション

ITARDA INFORMATION

交通事故分析レポート No.111

Special feature

Reducing the number of injured people while driving

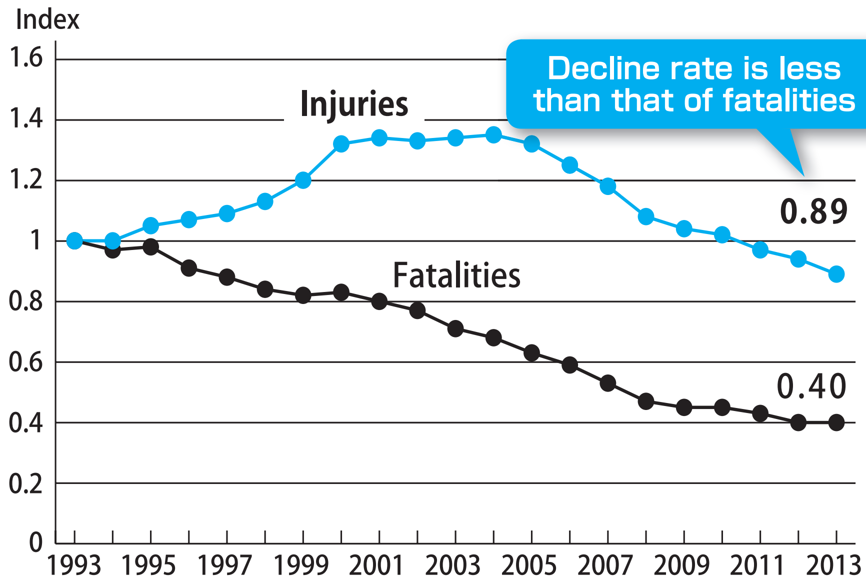


Fig.1 Trend in numbers of fatalities and injuries in traffic accidents (Index for 1993 data taken as 1)

Always wear seatbelts to reduce the damage level of injuries!!

1 Introduction

Trend in number of injured people in accidents

Fig.1 shows that the decline rate of the number of injured people (=serious injuries + slight injuries; hereafter “injuries”) is less as compared to that of fatalities. The trend shows that the injuries are almost constant at approx. 1.2 times the number of accident occurrences. But when the rates of fatalities and injuries are compared, whereas fatalities are declining over the years, injuries continue to increase. It can be inferred that advancements in car technologies and medical services have managed to reduce the damage in accidents from fatalities to serious or slight injuries (Table 1).

Table 1 Trend in accidents and injuries

	Accidents (cases)	Fatalities (people)	Injuries (people)	Injuries / Accidents (people/case) — Constant at ≈1.2 times	With respect to fatalities + injuries: Rate of fatalities (%) — Decline	With respect to fatalities + injuries: Rate of injuries (%) — Increase
1993	724,678	10,945	878,633	1.21	1.2	98.8
1994	729,461	10,653	881,723	1.21	1.2	98.8
1995	761,794	10,684	922,677	1.21	1.1	98.9
1996	771,085	9,943	942,204	1.22	1.0	99.0
1997	780,401	9,642	958,925	1.23	1.0	99.0
1998	803,882	9,214	990,676	1.23	0.9	99.1
1999	850,371	9,012	1,050,399	1.24	0.9	99.1
2000	931,950	9,073	1,155,707	1.24	0.8	99.2
2001	947,253	8,757	1,181,039	1.25	0.7	99.3
2002	936,950	8,396	1,168,029	1.25	0.7	99.3
2003	948,281	7,768	1,181,681	1.25	0.7	99.3
2004	952,709	7,425	1,183,616	1.24	0.6	99.4
2005	934,339	6,927	1,157,115	1.24	0.6	99.4
2006	887,257	6,403	1,098,566	1.24	0.6	99.4
2007	832,691	5,782	1,034,653	1.24	0.6	99.4
2008	766,382	5,197	945,703	1.23	0.5	99.5
2009	737,628	4,968	911,215	1.24	0.5	99.5
2010	725,903	4,922	896,294	1.23	0.5	99.5
2011	692,056	4,663	854,610	1.23	0.5	99.5
2012	665,138	4,411	825,396	1.24	0.5	99.5
2013	629,021	4,373	781,494	1.24	0.6	99.4

Rate of injuries and fatalities by type of accidents

Table 2 shows the rate and number of injuries and fatalities in total casualties for the year 2013 by type of accidents. The rate of injuries in vehicle to vehicle accidents is overwhelmingly high. As such, when we analyzed by type of accidents the numbers of injuries and fatalities in vehicle to vehicle accidents involving drivers as primary and secondary parties, as seen in Fig.2, “head-on/rear-end/angle collisions” accounted for 70% of both the injured and dead.

Table 2 Rate and number of injuries and fatalities by type of accident (2013)

		Vehicle to vehicle	Vehicle to pedestrian	Single vehicle
Injuries	Rate(%)	**88.9**	7.8	3.3
	No. of people	**694,923**	**60,737**	**25,834**
Fatalities	Rate(%)	40.3	34.3	25.4
	No. of people	**1,762**	**1,502**	**1,109**

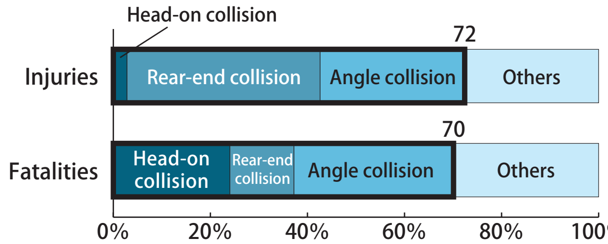


Fig. 2 Rate of injuries and fatalities of primary and secondary party drivers in vehicle to vehicle accidents by type of accident (2013)

In this issue, we therefore intend to isolate the factors that influence injury accidents involving primary and secondary party drivers and suggest ways to reduce the number of people injured.

<Except for Tables 6 and 8, the following data is based on the Road Traffic Accident Statistics from 2009 to 2013>

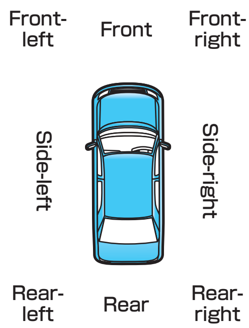
2 Characteristics of injury accidents

■Injuries are more when colliding part is "front" and "rear-end"

We analyzed the colliding part and degree of injury to human body in head-on, rear-end and angle collisions of four-wheeled vehicles (excluding other type of motor vehicles) involved as primary and secondary parties in injury accidents (Table 3). In the case of primary parties, the rate is highest when the colliding part is front of the vehicle, while it is the rear for secondary parties. Whereas the rate of head-on collisions for secondary parties is less than the rear-end collisions, the number of injuries is more for head-on collision in secondary parties than that of primary parties. Therefore our subsequent focus shall be on the data of rear-end collision in secondary parties and the head-on collision in primary/secondary parties. For reference, the number of fatalities for both primary and secondary parties was high for head-on collisions.

Table 3 Colliding part of the vehicle and degree of injury to human body

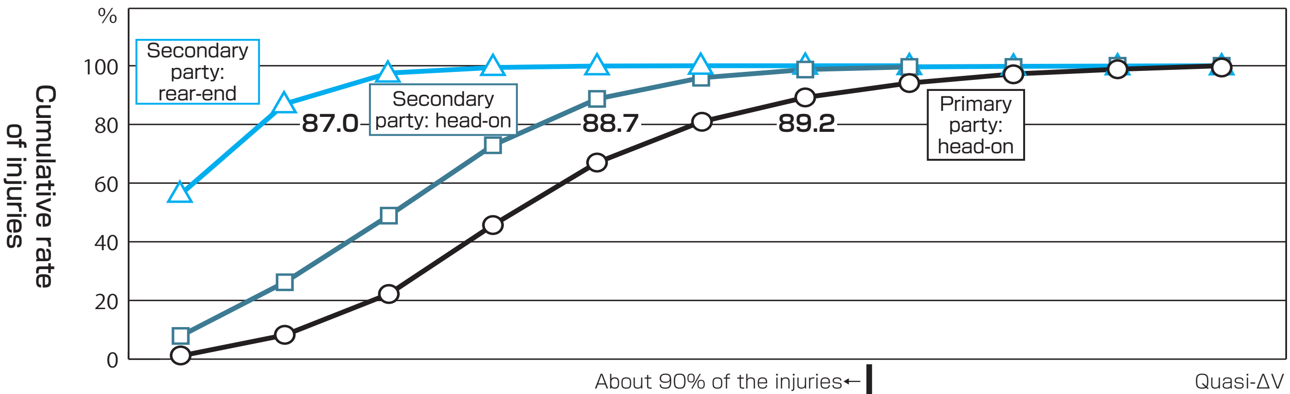
Degree of injury to human body	Party		Colliding part of the vehicle: Front	Front-right	Side-right	Rear-right	Rear	Rear-left	Side-left	Front-left	
Injury (serious + slight)	**Secondary**	Rate(%)	10.7	8.1	6.7	3.9	**56.9**	3.2	5.3	5.1	
		No. of people	146,164	110,088	92,158	53,355	776,541	44,333	72,388	70,298	n=1,365,325
	Primary	Rate(%)	**42.0**	16.8	7.9	1.9	2.1	2.1	10.1	17.0	
		No. of people	64,216	25,709	12,131	2,964	3,150	3,184	15,439	25,934	n=152,727
Fatality	Secondary	Rate(%)	**37.3**	21.9	10.2	3.3	11.9	1.3	7.4	6.7	
		No. of people	201	118	55	18	64	7	40	36	n=539
	Primary	Rate(%)	**59.8**	16.2	7.4	0.4	0.8	0.3	6.3	8.8	
		No. of people	2,425	657	298	17	31	14	254	358	n=4,054



■What was the speed just before the collision?

It is hard to estimate the speed of the vehicles before collision, so that as a measure of speed during collisions that led to injuries, Quasi-ΔV*1 values (Since the Danger Perception Speed (hereafter "DPS") of the driver based on the estimated variance in vehicle speed before and after collision (hereafter "collision speed") and the complete vehicle curb mass is used for calculation purposes, there may be chances that it is lower than the speed before collision due to deceleration etc.), is used for the analysis.

Fig.3 shows the rise in the rate of injuries in the head-on and rear-end collisions of secondary parties and the head-on collisions of primary parties. Rear-end collisions of secondary parties accounted for maximum injuries at 87% when the collision speed was 20km/h or less. Speaking in extreme, if rear-end collisions of secondary parties at a collision speed of 20km/h or less can be eliminated, as much reduction in injuries could be achieved. Similarly, the rate of injuries stands at 89.2% for head-on collisions at 70km/h or less in primary parties and at 88.7% for head-on collisions at 50km/h or less in secondary parties.

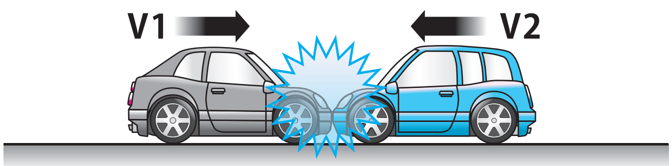


Colliding part	~10km/h	**~20km/h**	~30km/h	~40km/h	**~50km/h**	~60km/h	**~70km/h**	~80km/h	~90km/h	~100km/h	over 100km/h
Primary party: head-on	1.1	8.2	22.2	45.7	67.0	80.9	**89.2**	94.1	97.2	98.8	100.0
Secondary party: head-on	7.9	26.2	48.9	72.9	**88.7**	95.9	98.7	99.6	99.8	99.9	100.0
Secondary party: rear-end	56.2	**87.0**	97.5	99.4	99.9	100.0	100.0	100.0	100.0	100.0	100.0

Unit: %

Fig. 3 Cumulative rate of injuries by colliding part of vehicle and Quasi-ΔV (collision speed)

※1 Quasi-ΔV refers to the estimated variance in vehicle speed before and after collision and is calculated based on danger perception speed of the colliding vehicle and complete vehicle curb mass of the vehicle. Here it is shown as “collision speed.”



For reference: Consider that your vehicle (1) and other party's vehicle (2) collide, then the estimated equation for “Collision speed” (Quasi-ΔV) of your vehicle during head-on collision is as follows:

$\Delta V1 = M2 / (M1+M2) \times (V1+V2)$
where
M = complete vehicle curb mass,
V = danger perception speed

Supposing M1 is 1000kg and M2 is 1500kg while the danger perception speed for both vehicles is 50 km/h, thenΔV1 = 60 km/h.

■70% of the injuries can be reduced if danger is evaded at a DPS of 40km/h or less

Further, we analyzed the correlation between DPS and collision speed (Quasi-ΔV). In the case of rear-end collision of secondary parties, there may be situations when the driver cannot do anything even if he/she perceives danger; therefore we considered the DPS of primary parties. Also, for head-on collisions, the result for primary and secondary drivers is totaled and the DPS of “vehicle drivers” is considered.
The blue-shaded cells in Tables 4 and 5 show the presumed number of people who escaped with no injuries when the “primary party drivers” or the “vehicle drivers” explained above perceived danger and applied brake at a DPS of 40km/h or less. In the real world, accidents may not always be avoided completely even if the speed is low. However, as evident from Tables 4 and 5, 86.5% injuries from rear-end collisions of secondary parties and 67.7% injuries from head-on collisions of vehicles have been saved respectively when the DPS is less.

Table 4 Correlation between DPS and Collision speed of the injured in “rear-end collisions of secondary parties”

		Collision speed of **secondary party** (Quasi-ΔV)										
		~10km/h	~20km/h	~30km/h	~40km/h	~50km/h	~60km/h	~70km/h	~80km/h	~90km/h	~100km/h	over 100km/h
DPS of primary party driver	Stopping ~10km/h	228,819	0	0	0	0	0	0	0	0	0	0
	~20km/h	124,696	9,615	0	0	0	0	0	0	0	0	0
	~30km/h	26,328	88,553	2,373	0	0	0	0	0	0	0	0
	~40km/h	8,157	91,599	27,227	1,682	0	0	0	0	0	0	0
	~50km/h	3,938	21,079	33,380	5,741	1,040	0	0	0	0	0	0
	~60km/h	1,795	3,703	9,029	4,349	173	341	0	0	0	0	0
	~70km/h	549	813	942	1,008	353	287	46	0	0	0	0
	~80km/h	393	593	381	472	245	112	90	3	0	0	0
	~90km/h	317	410	151	86	83	32	13	17	1	0	0
	~100km/h	315	482	121	44	57	40	9	7	5	0	0
	over 100km/h	108	223	103	19	11	5	6	2	0	1	1

Unit: People

Rate of blue-shaded cells in total=86.5%

Table 5 Correlation between DPS and Collision speed of the injured in “head-on collisions of vehicles”

		Collision speed of **vehicle** (Quasi-ΔV)										
		~10km/h	~20km/h	~30km/h	~40km/h	~50km/h	~60km/h	~70km/h	~80km/h	~90km/h	~100km/h	over 100km/h
DPS of vehicle driver	Stopping ~10km/h	823	1,269	451	86	16	5	1	1	0	0	0
	~20km/h	77	583	471	172	28	7	3	1	0	0	0
	~30km/h	47	370	1,240	723	188	41	7	1	0	1	0
	~40km/h	60	259	1,022	2,064	1,124	387	140	34	8	1	0
	~50km/h	51	154	306	885	1,309	717	304	169	93	22	3
	~60km/h	28	55	76	173	234	285	190	78	49	36	34
	~70km/h	3	9	10	18	42	53	38	21	9	9	9
	~80km/h	0	1	3	5	9	13	20	7	4	7	6
	~90km/h	1	1	1	1	2	5	1	4	2	0	4
	~100km/h	0	2	0	2	4	0	3	3	1	2	0
	over 100km/h	0	0	0	0	0	0	0	0	0	0	0

Unit: People

Rate of blue-shaded cells in total=67.7%

Correlation between the speed and distance to avoid collision (Rear-end collision with stopped vehicle)

Sparing the details, 88.7% of the rear-end collision type of accidents happened with stopped vehicles. Calculations based on Table 3 indicates that 51.4% of the injured resulted from rear-end and 13.9% from head-on collisions. Consequently, we analyzed the time good enough for noticing a vehicle stopped in front to avoid collision with it.

Upper section of Table 6 shows the correlation between the driving speed and stopping distance of vehicles and the time taken to stop the vehicle by the sliding friction coefficient (hereafter "SFC") of road surface. The lower section shows the driving distance for each of the speeds in 3 seconds (=1 sec of idle running time + 2 sec, an estimate of safe inter-vehicle distance recommended by the Metropolitan Police Department etc.[1) 2)]). Accordingly, if a stopped vehicle is noticed 3 seconds earlier, collision can be avoided even at a speed of 20km/h or less when the vehicle is running on a frozen road with a SFC of 0.15; however, collisions can be avoided only upto paved road (wet) with a SFC of 0.4 and upto to a speed of 50km/h. Nevertheless, the required distance varies with the speed of other vehicle, road surface and tire conditions, among other factors. Therefore in order to avoid accidents, it is necessary to pay attention forward and to drive at a speed where one can quickly notice the other vehicle and stop.

Table 6 Speed, stopping distance and stopping time of vehicles by sliding friction coefficient of road surface[1)2)] (at idle running time of 1 sec)

SFC of road surface	Speed km/h	10	20	30	40	50	60	70	80	90	100
0.7 Paved (dry)	Stopping distance (m)	**3.3**	**7.8**	**13.4**	**20.1**	**28.0**	36.9	47.0	58.2	70.6	84.0
	Stopping time (sec)	**1.4**	**1.8**	**2.2**	**2.6**	**3.0**	3.4	3.8	4.2	4.6	5.0
0.4 Paved (wet)	Stopping distance (m)	**3.8**	**9.5**	**17.2**	**26.9**	**38.5**	52.1	67.7	85.2	104.7	126.2
	Stopping time (sec)	**1.7**	**2.4**	3.1	3.8	4.5	5.3	6.0	6.7	7.4	8.1
0.3 Snow-covered	Stopping distance (m)	**4.1**	**10.8**	**20.1**	**32.1**	**46.7**	63.9	83.7	106.2	131.3	159.0
	Stopping time (sec)	**1.9**	**2.9**	3.8	4.8	5.7	6.7	7.6	8.6	9.5	10.4
0.15 Frozen	Stopping distance (m)	**5.4**	**16.1**	32.0	**53.1**	**79.5**	111.2	148.0	190.2	237.6	290.2
	Stopping time (sec)	**2.9**	4.8	6.7	8.6	10.4	12.3	14.2	16.1	18.0	19.9

(Combinations where the vehicle can be stopped within the stopping distance of 3 seconds)

	Stopping distance in 3sec (m)	8.3	16.7	25.0	33.3	41.7	50.0	58.3	66.7	75.0	83.3

The above values for sliding friction coefficient of road surface are referred from the following materials 1) and 2).
Stopping distance/stopping time is calculated from the equation, $m\alpha=-\mu mg$; where m= vehicle mass (kg), α= deceleration (m/s^2), μ=sliding friction coefficient of road surface and g= acceleration due to gravity (m/s^2).

1) Public Works Research Center (general incorporated foundation), Technical Research Center, Road Research Department: Sliding Friction of Road Surfaces, Criteria for Road Surface Management and Sliding Accidents; Civil Engineering Journal 52-5 (2010), Table 2.[3)]
2) Shinnippon-Hoki Publishing Co., Ltd. – Table of braking time and braking distance for dry/wet asphalt roads[4)], Handbook on compensation for damages in traffic accidents.

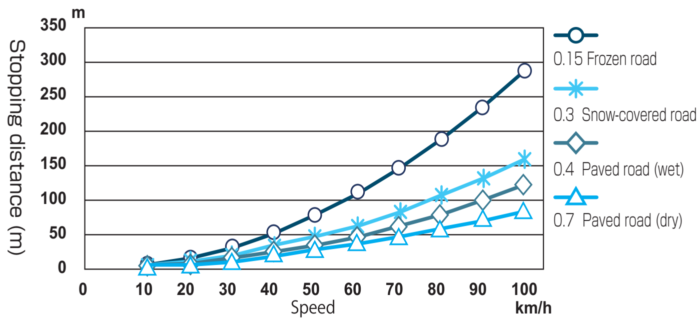


Fig. 4 Vehicle speed and stopping distance by SFC of road surface

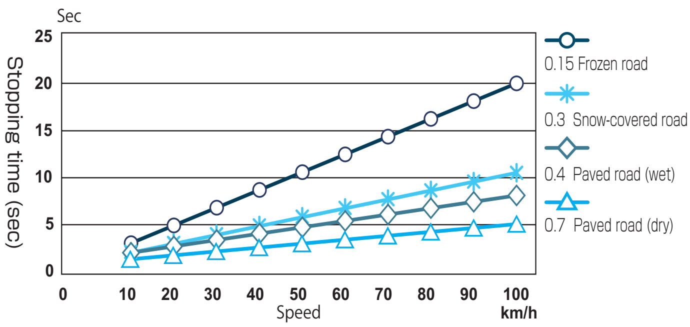


Fig. 5 Vehicle speed and stopping time by SFC of road surface

■Always wear seatbelt to reduce the level of injuries due to collisions

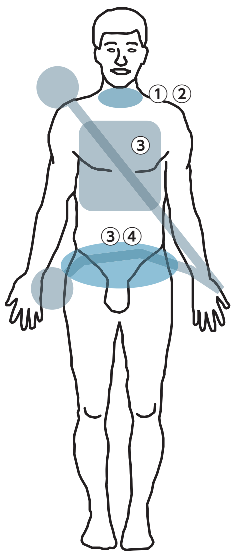
Table 7 shows the number of injured people for the top three body parts mainly injured (neck, chest, and waist) by the state of main injuries. Apparently, ① neck sprain tops the list, followed by ② ③ (refer ④) for "scratch, abrasion or bruise" in neck, chest and waist, in that order. The chest and waist injuries were sustained due to restraining by seat belts, while the neck injuries due to whiplash in the absence of a restraining object or the rubbing of the seatbelts. Sparing the details, when the seatbelt is not fastened, injuries like scratch, abrasion or bruise on the head in the cases of head-on collisions of primary parties and the rear-end collisions of secondary parties, and injuries like leg fracture in the case of head-on collisions of primary parties are more in number. This is indicative of the fact that on collision, not fastening the seatbelts would have resulted in significant movement of passengers, leading to injuries due to impact with vehicle parts. It is mandatory to fasten the seatbelt when occupying a vehicle. It plays an important role in reducing the injury level in accidents.

Table 7 Number of injured people by body parts mainly injured and state of main injuries

Body parts mainly injured	State of main injury*1	Secondary party: Rear-end collision	Secondary party: Head-on collision	Primary party: Head-on collision
Neck	Scission	0	0	0
	Fracture	156	198	415
	Rupture of internal organs	13	5	0
	Sprain	① **525,450**	① **72,166**	① **18,921**
	Dislocation	692	104	54
	Scratch, abrasion or bruise	② **171,549**	② **28,508**	② **8,778**
Chest	Scission	1	8	5
	Fracture	443	3,059	4,274
	Rupture of internal organs	1	8	36
	Sprain	851	344	172
	Dislocation	20	13	15
	Scratch, abrasion or bruise	2,540	③ **9,639**	③ **7,440**
Waist	Scission	0	0	0
	Fracture	116	252	847
	Rupture of internal organs	1	2	4
	Sprain	④ **15,391**	2,781	619
	Dislocation	36	21	14
	Scratch, abrasion or bruise	③ **15,929**	3,759	1,182

*1 : Excludes drowning, death from suffocation/drowning etc.

Unit: People　Unit: People　Unit: People



■Whiplash Injury Lessening seats are effective in reducing neck injuries

Seatbelts play a vital role in suppressing injuries in accidents; nevertheless, many people sustain injuries in the neck region as the head movement is not restrained by any object. Whereas the legal requirements of neck injury standards are met with, new vehicles sold in recent times equipped with Whiplash Injury Lessening (WIL) seats are becoming increasingly popular. These seats have modified structures and have mechanisms to reduce neck injuries in collisions, such as the head restraint lunges forward in case of an accident.

Table 8 shows the rate of neck injuries with or without the WIL seats installed in vehicles, indicating lower rate of injuries if installed. WIL seats were installed in 56.3% [5)] of the passenger cars manufactured in 2012 and the percentage of vehicles equipped with WIL seats is expected to increase in future.

Table 8 Rate of injuries in collision accidents by presence/absence of WIL seats (Cumulative total of 8 Japanese car manufacturers from 2008-2012)

WIL seats	Level of injury	Body part mainly injured	Rate against total injuries※ (%)
Present	Serious/slight injury	**Neck**	**21.7**
		Other parts	1.8
	No injury	Other parts	22.9
Absent	Serious/slight injury	**Neck**	**24.7**
		Other parts	2.4
	No injury	Other parts	26.4

※Total injuries, n=534,736

3 Case examples of accidents

The case examples in this section indicate the significance of “danger prediction,” “seatbelt” and “deceleration till accidents occur”, so utilize these learnings in your routine driving.

- Case example 1) Victim of rear-end collision, anticipated and prepared himself for the collision, so escaped with slight injuries.
- Case example 2) Perpetrator in rear-end collision, had not fastened the seatbelt and died in the accident.
- Case example 3) Head-on collision. Both parties decelerated, so the level of injury was slight.

Case example 1)

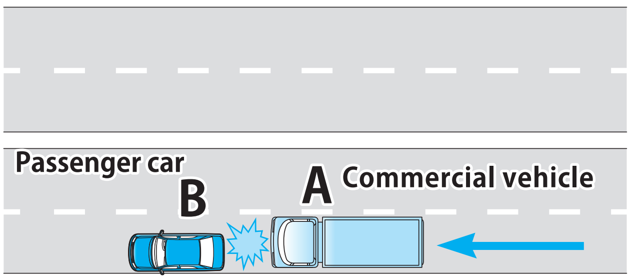
This rear-end collision with a parking vehicle occurred on a 4-lane, two-way traffic straight road with unobstructed view. Mr. A, in his late twenties driving a commercial vehicle stopped in lane-1 of an intersection with traffic signal. Although Mr.A had noticed a stopped vehicle 100m ahead of him, as soon as the signal turned green, he speeded up in an effort to move to lane-2 by overtaking the vehicle parallel to him. He was so engrossed in this action that he was too late in noticing that he had approached too close to Mr.B and collided with the stopped vehicle at a speed of 80km/h, unable to apply a brake.
On the other hand, Mr.B, in his late fifties driving a passenger car had stopped his vehicle in lane-1 as he had felt sick while driving, and was about to get down of his car. At that moment he took notice of the speeding vehicle of Mr.A in his rear-view mirror and in a fluster closed the car door and held tightly on to the steering wheel and planted his feet firmly in preparing himself for the collision. In this collision, the rear side of Mr. B’s car was badly damaged; however he escaped with a slight injury of cervical sprain.
Despite not been able to fasten his seatbelt, the reason for Mr.B sustaining only a sprain in the neck is because he had “prepared himself for the collision by holding firm” to restrain his body movement when he gathered that the collision was inevitable.” Therefore, when stopping your vehicle at a place where there is a possibility of collision, it is important to heed more attention to traffic in the rear than when one is driving, so as to prepare oneself in case a collision occurs.

(Case example 1: Diagram of accident site)

Type of accident: Rear-end collision between two four-wheeled vehicles

Mr. A: In his late twenties, driving a commercial vehicle, slight injury (abdominal contusion), medium damage to front side of his vehicle.

Mr. B: In his late fifties, driving a passenger car, slight injury (cervical sprain), serious damage to rear side of his car.

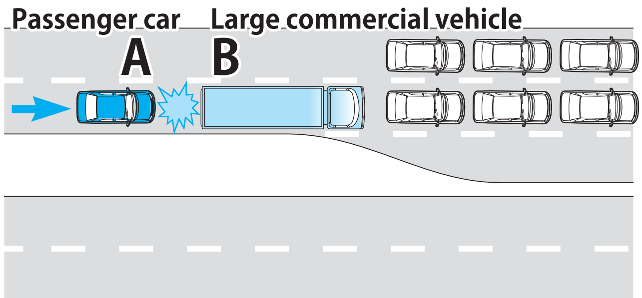


Case example 2)

This rear-end collision accident occurred in a signal-waiting traffic congestion on a straight road with unobstructed view. Ms. A, in her early fifties driving a passenger car who was the perpetrator in this accident died in this accident and on investigation it was found that her car collided at a speed of 40km/h onto a large commercial vehicle driven by Mr.B (in his early thirties) stopped at the tail-end of the congestion. Medium damage was caused to Ms. A's car, but deformation in the car interior was negligible. As Ms. A had sustained lacerated wound on her head when she was thrown over on to the front windscreen of her car, it was assumed that she had not fastened the seatbelt and the bruise in her abdominal region was caused by the deployed airbag after she was thrown forward from her seat.
The death of Ms.A could have been avoided had she fastened the seatbelt as this would have prevented her body from being thrown over and allowed the normal deployment of the airbag and serve its purpose of impact absorption. Therefore it is advisable to always fasten the seatbelt for the airbag as well to function properly.

(Case example 2: Diagram of accident site)

Type of accident: Rear-end collision between two four-wheeled vehicles
Ms. A: In her early fifties, driving a passenger car, died (abdominal bruise), medium damage to front side of her vehicle.
Mr. B: In his early thirties, driving a large commercial vehicle, no injury, rear side of his vehicle was slightly damaged.

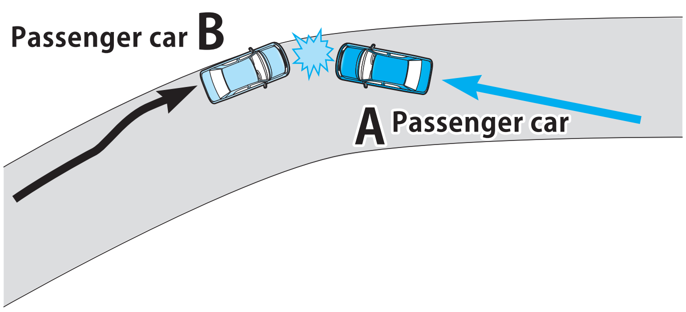


Case example 3)

This head-on collision occurred on a 7m wide curved road without a median line. Ms. A in her late fifties driving a passenger car at a speed of 40km/h, was returning on this road with obstructed view after dropping her family member at the hospital. So preoccupied was she with the thoughts of her hospitalized father that she drifted to the right side of the road and realized it late. When she noticed a vehicle approaching from the opposite side, she applied the brake.
Ms.B, in her late twenties driving a passenger car approached the curve at a speed of 40km/h on the way back from work. As Ms.B was aware that the road had obstructed view, she kept her vehicle to the left side of the road. When she saw the vehicle of Ms.A approaching towards her deviating from the opposite lane, she steered her car to the left and applied brake; but could not avoid it and resulted in a head-on collision.
This collision could have been avoided if Ms.A had paid attention forward. Although medium damage was caused to both the vehicles on the front sides, both Ms. A and Ms.B decelerated their cars on perceiving the danger. Applying brake alleviated the impact speed and allowed them to escape with only bruised chests.

(Case example 3: Diagram of accident site)

Type of accident: Head-on collision between two four-wheeled vehicles
Ms. A: In her late fifties, driving a passenger car, slight injury (bruised chest), medium damage to front side of her car
Ms. B: In her late twenties, driving a passenger car, slight injury (bruised chest), medium damage to front side of her car



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4 Conclusion

■Analysis result of injury accidents of primary and secondary parties while driving

(1) The number of injured people is more for rear-end collisions of secondary parties, followed by head-on collisions, whereas it is more for head-on collisions of primary parties. However, head-on collisions of secondary parties resulted in more number of injured people as compared to that of primary parties. Therefore, reduction in head-on and rear-end collisions could help reduce the number of injured people.

(2) The following accidents account for about 90% of the injured for the corresponding collision speeds (=Quasi ΔV)
- ・Rear-end collisions of secondary parties at 20km/h or less
- ・Head-on collisions of primary parties at 70km/h or less
- ・Head-on collisions of secondary parties at 50km/h or less.

(3) A correlation has been found between the number of injured people and the Danger Perception Speed (DPS) and collision speed.
(An estimate suggests that 86.5% injuries in rear-end collisions of secondary parties and 67.7% injuries in head-on collisions of vehicles can be reduced if collisions within the DPS range of 40km/h are prevented.)

(4) Injuries are more in the neck, chest and waist regions. (Injuries are of serious nature when seatbelt is not fastened.)

■Precautions for reducing the number of injured people

(1) The foremost thing is not to cause accidents. Therefore, it is important to maintain sufficient inter-vehicle distance and pay attention forward while driving. This will prepare in perceiving any danger soon enough and applying brake to decelerate and in avoiding the collision. Always fasten your seatbelt.

(2) Make efforts not to aggravate the level of damage in case of collisions.
- ・About 90% of the rear-end collisions are caused at a low collision speed level of 20km/h or less. Be careful about vehicles in the rear and if collisions are inevitable, brace yourself by holding tightly onto the steering wheel and get a firm footing so as to reduce your body movement to as little as possible. It may be possible to reduce neck injury by restricting the neck movement. When fellow passengers are present, shout and let them also know about the danger and prepare themselves for the collisions.
- ・In case of head-on collisions, the number of injured people is 34% more for DPS of 50km/h as compared to that of 40km/h. So dedicate yourself to driving at a lower speed.

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