

## CASR REPORT

## An Immediate Death by Seat Belt Compression; a Forensic Medicine Report

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**Abstract**

Although death is a gradual process, sometimes sudden death occurs in a fraction of a minute or seconds. Here we report a 49-year-old man without any underlying disease, which has instantly died in an accident scene due to compression of neck critical elements by a three-point seat belt. The examination of the body and the results of the autopsy, toxicology and pathology tests are described from the viewpoint of forensic medicine.

**Key words:** Seat belts; accidents, traffic; death; sudden

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**Introduction:**

Generally, a safety belt is essential during driving and often decreases the mortality rate of the passengers up to 50-75%. The majority of articles have been written about their benefits only, but it is also undeniable that in the case of improper use, seat belts can even be dangerous and life-threatening (1-4). The following report presents a rare mortality case with fatal asphyxia caused by the seat belt, referred to forensic department. Here the examination of the body and the results of the autopsy, toxicology and pathology tests are described from the viewpoint of forensic medicine.

**Case report:**

The deceased was described as a 49 year old man who was driving with a high speed of 110 kilometers per hour, in a highway in Tehran. His car had been hit hard from behind by another car. He died instantly without collision with the dashboard, steering wheel or any other part of the car according to the statement of the car passenger. The body belonged to a 49-year-old male, weighting approximately 85 kilograms, height 175 centimeters, with formal clothing and was examined in Tehran forensic autopsy center. Rigor mortis had been established and bruises with natural color were developed on the posterior surfaces of the body. Putrefaction was not evident.

**Examination:**

Time of death was estimated to be within the last 24 hours. In the examination, the deceased was in relatively good health and adornment. On the head and face, there were no signs of assaults, pressure around the

mouth and nose, congestion, conjunctival hyperemia and petechiae in the eye, foreign body in the mouth, or bone fracture. Face was pale. On the neck, strip-like bruises were visible on the left side. On the trunk, strip printed abrasion was seen starting from the upper left shoulder and extending diagonally to the right side (Possibly the pressure of the seat belt). Cardiopulmonary resuscitation signs weren't seen on the chest. On the extremities, abrasions were visible on the dorsum of the left wrist and anterior of the right forearm, abrasions and bruises were present on anterior right forearm and right groin. Defensive injuries, electrical signs, fracture and dislocation of joints weren't visible and tangible. Signs of injections weren't found. There was nothing abnormal in the genitals and anus.

**Autopsy:**

Grossly, the scalp was cut. There were no evidence of scalp and temporal muscle hematomas. The vault of the skull was removed. Brain tissue was normal in appearance. No signs of intracranial hemorrhage (ICH), intraventricular hemorrhage (IVH), sub-arachnoid hemorrhage (SAH), brain contusion, and space-occupying mass lesion were seen. Dura was removed. Skull base fracture wasn't evident. The skin was cut from the chin to the pubic. Hematomas were evident under the skin and between the muscles in accordance with the strip-like abrasions and massive bruises in the left intercostal muscle, in addition to hematomas on left side of neck and left anterior shoulder. The hyoid bone and thyroid cartilage in the neck were normal. In cutting the throat and larynx and trachea, hematomas were visible around the muscles of the left side of throat and larynx. There



was no sign of fracture and dislocation in larynx or foreign body in the airway. Pharynx and larynx were removed. Fracture and dislocation of the cervical spine weren't found. The body was also assessed in prone position and in autopsy of posterior spinal and dorsal cervical spine, no pathologic finding was found. Sternum and part of costal cartilages were pushed to the side. No abnormal peripheral blood or fluids were detected in the two sides of thoracic cavity. Lungs were congested in appearance and had a spongy consistency when touched and had no edema at the cutting. Pericardium was cut. Blood or other abnormal fluids were not found. The heart was removed from the base of the vessel. The weight was normal. there was an increased amount of fat around the heart. Aortic opening was normal and without atheromatic plaques. In the main coronary arteries, atherosclerotic stenoses were absent with a normal consistency and in slicing the heart muscle, fibrosis and hyperemia weren't evident. The abdominal cavity was open with no blood or other abnormal fluids. In the intra-abdominal organs, liver and spleen were normal and were not teared. Stomach had normal mucosa and contained semi-digested food. Intestinal rupture or perforation, necrosis or nigrescence and foreign body weren't observed. There was no retroperitoneal hematomas. The kidneys were normal. Urinary bladder contained urine. Other intra-abdominal organs were deployed without disruption to their anatomical location. To determine the cause of death, pathology specimen were obtained from heart, lung, brain, and cerebellum. In addition, vitreous, urine, bile, gut, and stomach samples were evaluated from toxicologic viewpoint. Finally, based on the results of examination, autopsy, and toxicology, the compression of neck critical elements such as carotid sinus was determined as the cause of death.

#### **Discussion:**

In addition to the speed, the road type, and the mechanism of the accident, type of the belt is also important in causing injuries (1, 2). There are different types of safety belts in vehicles including femoral belts, diagonal belts (shoulder) and three-point seat belts (thigh and shoulder) (3, 5, 6). Femoral belts were first popularized in Australia in 1964 (7). These belts are now used in the rear seats, and all new cars have three-point seat belts. If the femoral belt is fastened too high and placed on top of the hips, it can cause fracture on the body of vertebrae and transverse processes. Improper use of this type of seat belt can also lead to soft tissue injuries and even small bowel perforation and rupture of solid organs (8, 9). While all of these injuries are caused by higher fastening of the safety belts, even with the proper use of seat belts crossing over neck can happen. In this case, hip goes lower at the time of the collision of seat and slides under seat belt. However, most ab-

dominal cavities and spinal cord injuries are due to high fastening of seat belt (10-12). Any damage to the small intestine and colon and lumbar spine at the level of safety belt is called safety belt syndrome, abrasion and laceration of the abdominal wall is also common and is seen in 30% of patients and has been first reported by Braunstein, Garrett. By using three-point belts, collision with the dashboard and steering wheel will be avoided. However, this belt type may lead to fracture of ribs, sternum and clavicle and neck vertebrae; strangulation and hanging on the left side of the car have also been reported (13-15). A diagonal abrasion across the chest is usually associated with a three-point belt accompanied with fracture of ribs, sternum and clavicle in severe accidents and may also be associated with rupture of the aorta and ventricle of the heart and might cause vascular and tracheal and laryngeal lesions in the neck (16). Horizontal fractures caused by femoral belts in the second and third lumbar vertebrae was first reported in 1948 by Chance and fracture of C7-T1 transverse process have been reported in using three-point seat belts. In the three-point seat belts, the most common lesions are mesenteric rupture and rupture of vessels in the mesentery of the small intestine, additionally a colon rupture at the anti-mesenteric region related to jejunum and ileum were reported. In an article by Kirk Patrick, 68 cases out of 82 patients had lesions in the small intestine and 19 had colonic injuries (11, 13-15). Richard Bands et al. in 2011 reported that from a total of 130 patients with lesions caused by the seat belt, only 34 patients had cervical lesions (24 had soft tissue lesions) and 10 patients had neck fracture, all of which were associated with application of the three-point seat belts (16, 17). In the presented case, if the speed of the car was in the allowed range and safety belt was properly used, driver's immediate death would not have happened. Therefore, it is necessary to use the seat belt as a savior in the drivers, but we should not neglect the application of the standards of driving and the speed of the vehicle or else this very simple and valuable tool can change into a destructive one.

#### **Conclusion:**

It seems that, compression of neck critical elements such as carotid sinus by a three-point safety belt could be a rare potential cause of instant death following car accidents.

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#### References:

1. Al-Ghamdi AS. Pedestrian-vehicle crashes and analytical techniques for stratified contingency tables. *Accident Anal Prev.* 2002;34(2):205-14.
2. Rosman DL. The Western Australian Road Injury Database (1987-1996):: ten years of linked police, hospital and death records of road crashes and injuries. *Accident Anal Prev.* 2001;33(1):81-8.
3. Houston DJ, Richardson LE. The politics of air bag safety: A competition among problem definitions. *Policy Stud J.* 2000;28(3):485-501.
4. Soori H, Nasermodeli A, Movahedi M, et al. The effect of mandatory seat belt use legislations on mortalities from road traffic injuries in Iran. *Hakim Research Journal.* 2009;12(1):48-54.
5. Knight B. *Forensic pathology.* 2 ed. London: Taylor & Francis; 1996. 154 p.
6. Skaga NO, Eken T, Hestnes M, Jones JM, Steen PA. Scoring of anatomic injury after trauma: AIS 98 versus AIS 90—do the changes affect overall severity assessment? *Injury.* 2007;38(1):84-90.
7. Fenner P. Surf Life Saving Australia. *J South Pacific Underwater Med Soc.* 2005;35(1): 33-43.
8. Abu-Zidan FM, Eid HO. Factors affecting injury severity of vehicle occupants following road traffic collisions. *Injury.* 2015;46(1):136-41.
9. Afifi I, El-Menyar A, Al-Thani H, Peralta R. Seatbelt versus seatbelt and airbag injuries in a single motor vehicle crash. *Int J Crit Illn Inj Sci.* 2015;5(1):46-9.
10. Nantulya VM, Reich MR. The neglected epidemic: road traffic injuries in developing countries. *BMJ.* 2002;324(7346):1139.
11. Ameratunga S, Hajar M, Norton R. Road-traffic injuries: confronting disparities to address a global-health problem. *Lancet.* 2006;367(9521):1533-40.
12. Sharma B. Road traffic injuries: a major global public health crisis. *Public Health.* 2008;122(12):1399-406.
13. Akbari M, Naghavi M, Soori H. Epidemiology of deaths from injuries in the Islamic Republic of Iran. *East Mediterr Health J.* 2006;12(3-4):382-90.
14. Naghavi M, Abolhassani F, Pourmalek F, et al. The burden of disease and injury in Iran in the year 2003. *Iran J Epidemiol.* 2008;4(1):1-19.
15. PERRY AR, BALDWIN DA. Further evidence of associations of type A personality scores and driving-related attitudes and behaviors. *Percept and motor skills.* 2000;91(1):147-54.
16. Clarke S, Robertson I. A meta-analytic review of the Big Five personality factors and accident involvement in occupational and non-occupational settings. *J Occup Organ Psychol.* 2005;78(3):355-76.
17. Peden M. *World report on road traffic injury prevention.* World Health Organization Geneva; 2004.

