

Injury Produced by Seat Belts

Report of 2 Cases

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Reports of studies examining the safety of automobile occupants in relation to the use of seat belts indicate that injuries directly attributable to the effects of restraining belts are becoming more numerous. An extensive survey of information about the effectiveness of seat belts appeared in June 1961. This was followed in 1962 by other reports discussing restraining devices in general, the special problem of ejection and the role of safety locks and seat belts, pleas for restraining devices more adequate than the lap belt alone, and a case of severe neck injury believed by the attending physician to have been aggravated by the use of a combination lap and diagonal belt.

In 1963 there appeared additional reports with more extensive research apparent. These reports included a description of a patient suffering small-bowel perforation and a patient suffering a ruptured spleen and fractured ribs, both from use of a lap belt. Both these papers stressed the danger of wearing the lap belt too high across the abdomen rather than low across the pelvis. The most comprehensive reports analyzed accidents involving 837 drivers or front-seat passengers (all wearing belts) and 56 unbelted drivers or passengers in the same collisions. Considered were the differences in the manner of use of the lap belt — alone, diagonal alone, three-point lap and diagonal combination, and the full shoulder harness. No fatalities were included in this study. It is noteworthy that although 22% of the accidents were rollovers, there were no fires or reports of difficulty getting out of the vehicles because of the restraining devices. The authors concluded that the over-all injury rate was 51% lower in belt wearers, with an even greater difference if the slightly injured were included. As might be expected, belts with upper-torso restraints prevented head and neck injuries and contributed to chest injuries, usually just a matter of bruising. Of the collisions studied, 60% involved head-on and 25% roll-over collisions. In this study, 30% of the drivers of vehicles equipped with belts were not wearing the belts. A survey of parking lots has shown only 7% of cars equipped with belts.

An excellent review of the subject appeared in 1964, and, most recently, an analysis by Horace Campbell of 33 fatal crashes with seat belts.

Case Reports

With increasing use of restraining devices for passengers in automobiles, injuries attributable to the seat belts can be expected more frequently. Reported below are accounts of injuries to two automobile passengers, each of whom was wearing a three-point combination lap and diagonal belt. One occupant was injured critically, suffering

rib fractures and ruptured spleen. This appears to be the first report of a splenic rupture from use of a three-point combination lap and diagonal belt.

In August 1963, a 42-year-old woman, driving a Volkswagen sedan and accompanied by her 67-year-old mother as front-seat passenger, was involved in an automobile collision. By the nature of the accident the collision forces seemed slight, the Volkswagen striking a Renault broadside a few seconds after the former accelerated from a full stop. The speed of the Volkswagen was estimated at less than 10 mph, possibly less than 5. Each of the occupants was wearing, securely fastened, a three-point lap-diagonal belt. This diagonal was secured above shoulder height, by a bolt through the door-post on each side, extended down across the chest from the outside shoulder, and buckled at the middle of the car, meeting the lap belt. Immediately after the collision the driver felt a moderate pain in the sternum. The passenger had some chest pain and difficulty breathing. Deformation to the Volkswagen was slight, involving a few inches of the front end.

The driver's injuries consisted of scattered ecchymoses with one definite ecchymotic area over the sternum. Sternal pain persisted on motion and was finally proved to be the result of an undisplaced fracture of the sternum. No treatment or rest was required. Full recovery occurred in several weeks.

The passenger was brought to the hospital by ambulance and admitted fully conscious. She had been interrogated at the collision site for about 10 min., the attending police not believing injury of note had occurred. Complaints were of pain at the left lower anterior chest region. Examination and study disclosed fractures of the left fifth, sixth, seventh, eighth, and probably ninth ribs with slight displacement. Within 2 hr. the blood pressure lowered slowly and the pulse rose. Shortly thereafter, severe hypotension occurred, without loss of consciousness.

A diagnosis of ruptured spleen was considered and immediate surgery was planned. Suddenly the patient seemed moribund, having no apparent pulse, measurable blood pressure, or heart sounds. Emergency laparotomy without usual preparation disclosed massive bleeding from a severely lacerated spleen. Clamping of the pedicle of the spleen, followed by splenectomy and massive blood replacement, returned the vital signs to measurable. Postoperative atelectasis developed on the opposite (right) side, requiring eventual bronchoscopy and finally clearing.

Following the patient's discharge from the hospital, low-grade fever persisted and a fullness developed in the left upper quadrant of the abdomen; there was progressive regurgitation of all ingested material. Eventually, a mass was palpable and demonstrated by X-ray examination under the left diaphragm and a total obstruction of the lower esophagus occurred. Intubation for nasogastric feeding was started and there was progressive reversal of all these abnormalities to normal in 10 days.

The cause of this series of events is uncertain. The most likely explanation is the development of a left subdiaphragmatic abscess or hematoma which mechanically distorted the esophagus, causing complete obstruction. The spleen was studded with small sarcoid nodules, an incidental finding. No other abnormalities were found. A complete check-up a month before the collision had showed the patient to be normal. She had been on daily Coumadin for anticoagulation at the time of the collision, the medication being given for transient cerebrovascular insufficiency suffered 2 years before. Massive amounts of Vitamin K were given as antidote after the collision. It

appears that the bleeding from the spleen would have occurred in any event because of the magnitude of the lacerations.

Discussion

Severe and nearly fatal injuries resulted from the trauma of moderate collision in a person wearing a three-point combination diagonal and lap belt. It does not reasonably follow that the use of restraining devices should be discarded because they can cause injury. This blanket condemnation is favored by those who are uninformed or do not choose to use seat belts. The prime purpose of a restraining device, to minimize injury, may have been served. Perhaps the case described above indicates some flaws in the diagonal-lap belt combination, with which all the forces center themselves at one point of greatest strain. Evidence already considerable and further presented here suggests that abdominal complications occur with wearing of the lap belt too high on the abdomen. The passenger in question, short and obese, did in fact always wear it high. Probably best is the full shoulder harness restraint, which distributes the forces of collision more evenly. We now need better, safer automobile design to enable proper installation of suitable restraining devices.