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Seat-belt fracture of the tibia

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INJURIES involving car seat-belts are usually due to the force with which the car occupant is thrown against the belt in a collision. Various patterns of injury have been described. Injury to the lumbar spine or abdominal wall and contents is due to flexion of the spine over, or compression of the abdomen by, a lapbelt, producing the 'seat-belt syndrome' (Garrett & Braunstein, 1962). Fractures of the ribs and sternum may be produced by a diagonal belt (Fletcher & Brogden, 1967). Injuries to the face and neck, produced when a car-occupant wearing a lap-belt is thrown forward to dash his face on the facia or windscreen, are not due to the pressure of the belt, but the pattern of injury is determined by its action (*Lancet*, 1967).

Although the seat-belts contributed to the injuries in such cases, it is generally accepted that the collisions in which they occurred would have produced far more serious injuries but for the restraining action of the belts (Bourke, 1965). Even a lap-belt alone reduces the chance of serious injury by a factor as high as 30 (*Lancet*, 1967). Various reviews have found no case in which a seat-belt has actually caused severe injury, or increased the severity of the injuries (Lindgren & Warg, 1962; Gissane, 1963; *Brit. med. J.*, 1964).

The case described here, in which no injury would have occurred but for the belt, is reported because

it draws attention to a real and easily-avoided danger from seat-belts.

Case history

The patient was a 24-year-old woman, 7 months pregnant with her first child. She was a front-seat passenger in a car fitted with lap-strap and diagonal seat-belts which, when not in use, lay loose on the floor of the car. In getting out of the car she inadvertently put her left foot through a loop of the belt, which tightened round her leg a few inches above the ankle. This tripped her, so that she fell to the ground outside the car, with her left leg still caught in the belt.

She sustained a short spiral fracture of the left tibia 3-4 in. above the ankle, with a comminuted spiral fracture of the fibula at a slightly lower level (Fig. 1). The fracture was open from within, the end of the upper tibial fragment protruding through a wound about 2 in. long. Surgical toilet of the wound was performed under general anaesthetic, and balanced traction was applied to a Denham pin inserted through the left calcaneum.

Seventeen days after the injury an above-knee plaster cast was applied, and she was allowed up on crutches, but not bearing weight on the injured leg. Seven weeks after injury the plaster cast was changed from above-knee to below-knee type, to facilitate delivery, and 14 days later she was delivered, the

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FIG. 1. Radiograph of left ankle.

cast causing no obstetric problems. Ten weeks after injury she began to take weight on the cast, wearing a rocker boot, and the cast was removed 15 weeks after the accident. Her subsequent progress was uneventful.

Discussion

The various patterns of injury which occur when seat-belts are worn suggest their own prevention. It is now generally agreed that a lap-belt alone is inadequate, since it allows the upper part of the body to strike the fascia or windscreen, and will also

allow severe flexion of the lumbar spine. An additional diagonal belt to restrain the thorax is therefore recommended (Tolins, 1964). Injuries due to compression of the abdomen by the lap-belt may be avoided if the belt is worn low on the hips (Sube, Ziperman & McIver, 1967), with the upper edge below the anterior superior iliac spines. It must also be ensured that pressure on the diagonal belt in a collision does not pull the lap-belt up on to the abdomen (Campbell, 1964). To avoid this, the lap and diagonal belts should meet at or below the hip.

Although injuries such as in the case described here are unusual, another similar case has been reported to the author (Rutherford, personal communication 1967), and minor accidents from this cause are probably common. In order to avoid this danger, manufacturers of seat belts should make provision for placing the belts safely out of the way when not being worn, rather than lying loose on the floor of the car. If this depends on the user putting the belt away, it will be forgotten. The type of mechanism which automatically rolls the belt up is, therefore, preferable.

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