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Unsupervised Children in Vehicles: A Risk for Pediatric Trauma

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ABSTRACT. In this study, a series of instances of children injured by a motor vehicle set in motion by an unsupervised child are reviewed. During a 24-month period, nine such children were identified through a multihospital and coroner's office monitoring system in a single urban county. Injuries ranged from multiple abrasions and contusions to serious leg and head injuries. Three children died. The typical circumstance involved a child releasing the brake or placing the vehicle in gear in a private driveway which resulted in the vehicle striking or rolling over the victim. In four of the nine cases, the child who set the vehicle in motion fell or jumped from the vehicle and then became the injured victim. The extent of these unusual motor vehicle-related injuries is unknown because they are unlikely to be reported in official police statistics. According to the study findings, there is a need to educate the public and health professionals about the risks associated with leaving a child unattended in a motor vehicle and the hazardous environment of the private driveway. Preventive measures would include not leaving a child unattended in a vehicle, locking unattended vehicles to prevent access, and redesigning of private driveways. *Pediatrics* 1991;87:70-73; *motor vehicle injury, injury prevention.*

Motor vehicles are the greatest hazard to the health of our nation's children. Occupant injuries secondary to motor vehicle crashes and pedestrian injuries remain the most significant in terms of mortality. Less frequent causes of injury, but equally significant in terms of the potential for serious injury and death, are injuries to bicyclists and injuries in noncrash events.¹ An additional cause of pediatric motor vehicle-related injuries not detectable through police reporting was identified

through a hospital surveillance system, ie, injuries resulting from a child occupying a motor vehicle and setting it in motion.

The aims of this case study were (1) to describe the circumstances under which children caused motor vehicles to injure either themselves or others, (2) to describe the specific injuries, (3) to address the issue of police reporting of these injuries, and (4) to recommend interventions to eliminate the risks of injury in these conditions.

METHODS

Cases were identified through a hospital-based monitoring system for pediatric traffic-related injuries. The hospital-based monitoring system consisted of 10 of the 38 hospitals in Orange County, California (population 2.2 million) and the county coroner's office. Three of the four county-designated trauma centers and the major children's hospital in the county participated in the monitoring system.

A standardized questionnaire was completed for all cases of children less than 15 years of age seen at the hospital or coroner's office for motor vehicle-related injuries. Information on the circumstances of the event was obtained from a telephone interview with the parent or guardian as well as from paramedic reports, police reports, and newspaper articles, when available. Information on injuries, medical treatment, and disposition of the patient was abstracted from the medical record and the coroner's report.

RESULTS

Within the 24-month period of study (April 1987 to March 1989), nine cases were identified of children less than 15 years of age who were in a motor vehicle unsupervised and whose action caused sub-

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sequent injuries either to themselves or to other children or adults. The age of the child setting the vehicle in motion ranged from 25 months to 10 years; the mean age was 5.5 years. The age of the injured child was 19 months to 4⁷/₁₂ years; the mean age was 3.7 years.

Circumstances

In four cases the child shifted the vehicle into gear, and in five cases the child released the hand brake. One child was actually seated in a child safety seat that he climbed out of to set the vehicle in motion. The location of all but one of these events was a private or residential driveway. In one case the injuries occurred at a campsite in a state park.

In five cases the injured child was the one who set the vehicle in motion and then fell or jumped from the vehicle. In the other four cases a child standing or playing outside of the vehicle was the injured victim. Thus, all children were actually outside of the vehicle at the time of interaction between the child and the vehicle. In one case, two adults as well as a child were also injured. Circumstances and specific injuries are shown in Tables 1 and 2. Eight of the children were run over; one child hung onto the door and was dragged alongside the vehicle.

Injuries

All of the children sustained multiple injuries. The most common anatomic sites of injury were the head or face and lower extremity. Three children sustained severe intracranial injuries—decapitation, brain crush, and skull fracture with intracranial hemorrhage. Two children had lower extremity fractures and one child sustained blunt thoracic trauma resulting in traumatic asphyxia. All of the other injuries involved abrasions and contusions.

Two of the children were treated in the emergency room and discharged; five children were hospitalized for treatment. A total of three children sustained fatal injuries—two died at the time of the event and the other child survived for 11 months with severe neurologic impairment and subsequently died secondary to pneumonia.

DISCUSSION

Risk Factors

Two risk factors can be identified based on this series of cases: (1) allowing a child to remain in a vehicle that was either idling or stopped and (2)

TABLE 1. Children Injured by Setting Vehicle in Motion

Age & Sex	Location of Injury Event	Description of Circumstances of Event	Mechanism of Injury	Injuries	Treatment
2 y 9 mo, F	Residential driveway	In parked vehicle with older sibling, child put car in neutral; car rolled	Child jumped out of car & was run over	Multiple abrasions of back, elbow, & pelvis	Hospitalization, 1 d
4 y 3 mo, F	Residential driveway	Playing in parked car, child released brake; car rolled	Child dragged while hanging onto door	Multiple abrasions of abdomen & wrist	Treated in emergency room
4 y 7 mo, F	Residential driveway	Left in vehicle with younger sibling when mother ran into house, child climbed out of seat belt & released hand brake; car rolled	Child fell out of car & was run over	Traumatic asphyxia secondary to chest crush, abrasions of buttocks & thigh	Hospitalization, 2 d
10 y, M	Residential driveway	Child released brake & put car in neutral; car rolled	Child went behind car & was run over	Fracture of tibia/fibula	Hospitalization, 1 d

TABLE 2. Children Injured by Other Child Setting Vehicle in Motion

Age & Sex of Injured Child	Age & Sex of Child Setting Vehicle in Motion	Location of Injury Event	Description of Circumstances of Event	Mechanism of Injury	Injuries	Disposition
19 mo, F	3 y, M	Residential driveway	While father checked under hood of idling car, child put car in reverse	Child run over while standing near car	Crushed skull, avulsion brain, multiple abrasions	Died in ER
19 mo, F	Unknown child	Residential driveway	Child released brake & car rolled	Child run over while playing with children in driveway	Abrasion elbow, contusion, foot	Treated in ER
2 y 1 mo, M	2 y, M	State park	Left in idling car, child climbed out of child safety seat & put car in gear. Car accelerated & went 200 ft	Child run over while playing with family at campsite (2 adults also injured)	Decapitation, abrasions legs, arms & trunk	Died at scene
2 y 7 mo, M	9 yr, M	Residential driveway	Child moved gear shift & car rolled	Child run over while in driveway	Bilateral femur fx, abrasions face & feet	Hospitalized 5 days
3 y 6 mo, F	Unknown child	Residential driveway	Child released brake & vehicle rolled	Child run over while playing in driveway	Skull fx with intracranial hemorrhage, severe neurologic impairment	Hospitalized, died 11 months later, secondary to pneumonia

allowing a child to play outside in the vicinity of a parked, unlocked motor vehicle.

In the first situation, the young child, inquisitive, with adequate motor skills but inadequate cognitive skills to recognize the danger of manipulating a motor vehicle, is at special risk and should not be permitted to remain in a vehicle without adult supervision or to play in the vehicle at any time. For the second type of risk factor, children should be kept separate from motor vehicles, even when the vehicle is "parked" in the driveway. Children may gain access to a parked, unlocked vehicle and cause injury in the same manner as in these reported cases or may be injured by a moving motor vehicle. The driveway environment is hazardous. In addition to the circumstances of these cases, Satran² described two cases of children who sustained fatal injuries from electric garage door openers. Brison et al³ described fatal injuries from vehicles running over children while backing out of driveways. Although exposure data for this environment is unavailable for calculation of risk, the message is clear: Children and motor vehicles should not "share the same space."

Injury

The type of event described in this article is associated with the potential for serious and fatal injury; more than half of the children in this sample required hospitalization. Three children were fatally injured. The severity of injury in these cases is related to the fact that almost all of the injuries were incurred by the vehicle running over the child, ie, these children were injured as pedestrians. Bell et al⁴ described this roll-over phenomenon as low velocity vehicular injuries. In his series 31% were the result of an unattended child in the vehicle.

Magnitude/Police Reporting

The magnitude of this type of traumatic injury is unknown. Sporadic reports have appeared in the literature.⁴⁻⁶ However, these cases are unlikely to be reported in official police statistics for the following reasons: (1) These events occurred in private driveways (nonpublic roads) and hence are not reported as are events occurring on public roads. (2) If they were reported, it is not clear whether the children who were injured would be entered as pedestrians. Technically all children were injured outside of the vehicle. However, in the cases in which the child was both the driver/occupant and the injured victim, it is not known whether they would be entered as a driver/occupant or as a pedestrian if police were called to the scene.⁷ (3) As with noncrash events, parents may transport the

child to a medical facility for treatment and may not consider it as a motor vehicle-related injury.⁸

INTERVENTIONS

The first step in developing an intervention strategy must be an educational campaign aimed at both parents and caretakers of children, as well as at educators and health professionals, regarding the risk of allowing a child to remain unsupervised in a vehicle even for short periods of time. The preventive measures include (1) never leaving a child alone in the vehicle, even when the child is restrained; (2) locking vehicles at all times to prevent access by children; and (3) not allowing children to play in the vicinity of a motor vehicle even if the vehicle is parked. This last recommendation has important implications for preventing other types of vehicle-related injuries as well, ie, those incurred by children playing in private driveways who are struck by vehicles entering or leaving the driveway and injuries secondary to electric garage door opening. Two preventive measures that seem most effective and are passive measures that require no action on the part of the driver are (1) redesigning and/or modification of home driveways, such that the vehicle is parked in an enclosed space with its own access away from areas in which children would be playing, ie, gated driveways; and (2) designing cars that children can't drive, ie, a key in the ignition or the minimum weight of an adult sized body in the driver's seat is needed to release a brake or shift the transmission into neutral.

CONCLUSION

Nine children and two adults sustained multiple and serious injuries as a result of a child being left unsupervised in a motor vehicle. In all cases the child set the vehicle in motion. Some of the children

were subsequently run over by the vehicle as they jumped or fell out, or the vehicle ran over another child or adult in the path of the moving vehicle. Three children sustained fatal injuries. Elimination of this hazard by not allowing children to play or remain in a motor vehicle without adult supervision, locking vehicles to prevent unauthorized access, and vehicle design to prevent gear shifts and brake release by a child would have prevented these injuries. Finally, redesign of private driveways such that they are available for vehicle access only and apart from play areas would reduce these injuries and eliminate many of the pedestrian driveway injuries.

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