

## Four children crushed in their driveways

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Pedestrian injuries are a leading cause of mortality and morbidity in childhood<sup>1</sup>. In most cases the child is struck by a fast-moving vehicle, but injuries sustained in the driveway form a distinct subgroup<sup>2</sup>. We report four cases seen over a 5-year period (1995-1999) in a regional paediatric surgical centre.

### CASE HISTORIES

#### Case 1

A girl aged 2 sustained a severe crush injury to the chest and abdomen after being run over by a neighbour who was reversing the car in the driveway. In the accident and emergency department she was noted to have a widespread petechial rash and suffusion over her upper chest, neck and face. There was patterned bruising on the abdomen. On primary survey her airway was patent, but she was tachypnoeic and required face mask oxygen to maintain a normal oxygen saturation. Her peripheral perfusion was poor but her haemodynamic status became normal after an intravenous bolus of 20 mL/kg of crystalloid.

A computerized tomographic (CT) scan of the abdomen and chest revealed evidence of pulmonary contusion, a capsular tear in the spleen, contusion around the second part of the duodenum and superficial lacerations of the liver, particularly in the region of the caudate lobe. Her injury severity score (ISS)<sup>3</sup> was 26. She was electively intubated and ventilated and received intravenous analgesia, broad-spectrum antibiotics, chest physiotherapy and nasogastric enteral feeding. She was managed non-operatively and serial ultrasound imaging demonstrated resolution of her intra-abdominal injuries. She was extubated after 6 days and discharged home after 17 days, eventually making a complete recovery.

#### Case 2

A 15-month-old toddler sustained a blunt injury to the abdomen as a result of being run over by her mother, who was reversing the car in the driveway. On arrival at hospital she was normotensive, mildly tachycardic and neurologically normal. CT imaging of her head, chest and abdomen demonstrated a small left pneumothorax with ipsilateral apical pulmonary contusion and a right parieto-temporal skull fracture. She also had a closed fracture of the right femoral shaft. Injury severity score was 14. Her injuries were treated non-operatively and she was discharged home 17 days after admission.

#### Case 3

A toddler aged 13 months was transferred from another hospital having been crushed by the bumper of a car reversing in her driveway. At the referring hospital she required insertion of a chest drain for a right pneumothorax which was associated with radiological signs of pulmonary contusion. Her ISS was 11. After transfer she remained clinically stable apart from a mild pyrexia which resolved after treatment with intravenous broad-spectrum antibiotics. She was discharged home 3 days after admission.

#### Case 4

A 4-year-old boy was admitted after sustaining a crush injury of the chest. Sitting on the back seat of a car without a seatbelt he had opened the rear door, fallen out and been run over whilst his father was reversing in the driveway. A CT scan of the chest revealed fractures of the right second and fifth ribs with a small ipsilateral haemopneumothorax and right upper lobe pulmonary contusion. Abdominal CT scan was normal and his ISS was 11. Treatment included insertion of a chest drain, chest physiotherapy and the administration of broad-spectrum intravenous antibiotics and

opioid analgesia. He remained haemodynamically stable and was discharged home after 3 days, making a complete recovery.

## COMMENT

Reported experience of driveway injuries in children has been largely confined to the USA, where they represent about 10% of injuries in child pedestrians and are commonly fatal<sup>4,5,6,7</sup>. Is our experience of four cases in 5 years, all non-fatal, likely to reflect the true picture? We looked at two other local sources, in Leeds and Sheffield. During the same period, 1995-1999, five fatalities from motor vehicle accidents in children under 5 were recorded in the accident and emergency departments of the Leeds Teaching Hospitals NHS Trust. None was the result of a driveway injury.

In the accident and emergency records at Sheffield Children's Hospital 67 road traffic accidents affecting children in the 0-5-year age group could be identified over the same period. 53 were pedestrian injuries, 6 of which were fatal. Again, none was from a driveway injury. Perhaps the difference from American experience reflects the proportion of residences with cars and driveways.

In this series, all the children sustained blunt chest/abdominal injuries and one had additional limb and head injuries. The age distribution is consistent with previous evidence that 1-2-year-old toddlers are most at risk from driveway injuries<sup>5,6,7</sup>. In the USA, these accidents occur most often in the spring and summer; two of our children sustained their injuries during the autumn and two in summer. Winn *et al.*<sup>7</sup> reported five fatal driveway injuries at a median age of 14 months. Four of the children died as a result of a head injury and one from head, chest and abdominal injuries. In the largest series of driveway injuries, 37% of young children (<4 years) sustained a closed head injury, 32% had torso trauma, 46% had skeletal trauma, and the fatality rate was 20%<sup>4</sup>.

Potential risk factors for driveway injuries include a children's play area adjacent to the driveway, shared driveways, male sex, and low socioeconomic status<sup>1,2,8</sup>. Most incidents occur during daylight hours<sup>1,7</sup>. Unsupervised children in a vehicle are capable of setting the car in motion and injuring themselves directly or other children playing in the driveway<sup>4,9</sup>.

Separation of the driveway and children's play area by a low-level fence may be one way to prevent these injuries<sup>2</sup> but probably more important is to make parents aware of the hazard. Toddlers may be difficult to see in the rear-view mirror, particularly with the large four-wheel-drive vehicles now popular, but the frequency of these injuries is not high enough to demand redesign to improve rear visibility (and there may be competing safety considerations). A car reverse alarm may be a helpful warning of danger.

Although uncommon, driveway injuries tend to be severe and may be fatal. They are devastating for parents and others who are responsible for the accident. These injuries deserve wider recognition in accident prevention programmes.

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