Nonambulatory “Pedestrians”: Infants Injured by Motor Vehicles in Driveways

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Introduction

Motor-vehicle-related injuries are the leading cause of death in children.1 Approximately one third of deaths occur in pedestrians,2 individuals defined by the International Classification of Diseases, Ninth Revision External cause codes (E-codes) as “person(s) involved in a [motor vehicle] accident who were not at the time of the accident riding in or on a motor vehicle.”3 Research into child pedestrian injuries reveals that the circumstances surrounding these events differ by age.2,4 Preschool and school-aged children are most commonly struck by cars during midblock “dart-out” events, while toddlers are more frequently injured by vehicles traveling in reverse in driveways and other nontraffic locations. The details of injury events in which infants are struck by motor vehicles are less well described. While not pedestrians in the literal sense, infants are categorized as such in injury surveillance databases by the ICD-9 external cause code (E-code) definition noted above. These incidents are uncommon, with 69 infant “pedestrian” deaths occurring in the United States between 1990 and 1994,5 and the death rates are ten times lower than those seen in toddlers and older children.6 It is therefore likely that these injury events have unique characteristics that would have implications for age-appropriate prevention recommendations. To date, most reports specifically describe the experience of older ambulatory children and toddlers, outlining prevention strategies relevant to that population.2,6,7 This report details recent experience with two nonambulatory, infant “pedestrians” who were seriously injured by motor vehicles in nontraffic settings.

Patient Reports

Patient 1

A 3-month-old infant girl was transferred to the Pediatric Trauma Center from a local hospital after sustaining a crush injury to her right lower extremity. The infant had been placed in the shade on the driveway of the family’s home in a fabric, metal framed, infant “bouncing” chair while her mother cleaned the porch. Her father moved the car out of the garage and backed the left rear tire over her foot. Evaluation of her injury revealed a markedly swollen right foot with barely palpable pulses. Radiographs of the extremity showed no fractures, but measurement of pressures in the plantar compartment were found to exceed 60 mmHg, consistent with compartment syndrome. She was taken to the operating room for a three-incision fasciotomy. The infant was discharged in good condition on the fifth hospital day following debridement and closure of the fasciotomies.

Patient 2

A 3-month-old infant boy was transported by helicopter to the Pediatric Trauma Center from a local urgent care center after he was backed over by the father’s pickup truck in the driveway of the grandmother’s home. The infant had been placed on the driveway in an infant car seat next to the front passenger side of the truck when his father inadvertently backed over the infant, crushing his head under the right front wheel while moving the truck to a more convenient location. The family took the infant to the urgent care center where he was resuscitated and transported...
to our facility. A computed tomo-
graphy scan demonstrated mul-
tiple skull and midface frac-
tures with significant subarach-
noid and intraventricular hemor-
rhage and a large frontal subdural
collection. He was taken to the op-
erating room where he died of
brain herniation from massive
cerebral edema and brain injury.

Discussion

Pedestrian injuries in ambula-
tory children less than 3 years of
age have been well character-
ized. Occurring commonly in
locations other than public streets
like driveways, sidewalks, or park-
ing lots ("nontraffic" sites), these
events frequently happen while
the child is playing in the drive-
way and is backed over by a vehi-
cle driven by a family member.
These nontraffic injury events dis-
proportionately involve vans,
trucks, pickups, and four-wheel-
drive vehicles. The injuries sus-
tained most often involve the
head and face, torso, and lower
extremities. While the available
studies on injuries in young
pedestrians include children less
than 1 year of age, some exclude
those who were nonambulatory and
others do not distinguish the
infants from the other children in
their samples. Therefore, it is
not known if the injury event
characteristics attributed to tod-

dlers accurately describe those
events involving nonambulatory
infants.

The injury circumstances ex-
perienced and injuries sustained
by our two infant patients do
share some common characteris-
tics with the patterns observed in
toddler pedestrians. In both in-
stances, family vehicles backed
over the infants, causing head and
extremity injuries. One event in-
volved a pickup truck. Unlike tod-
dlers, however, who are fre-
quently hit when they run onto or
are playing on driveways, these
infants were placed on the drive-
ways in infant seats by caretakers
and run over by individuals un-
aware of the infants' locations.

Various prevention strategies
for driveway pedestrian injuries in
toddlers have been suggested pre-
viously. Environmental modifi-
cations such as fencing driveways,
providing fenced play areas away
from the driveway, and driveway
town (circular) that would
preclude the need for backing
up have been recommended as
the methods most likely to be suc-
cessful. Automobile modifications
including back-up warning
alarms, similar to those on indus-
trial vehicles, or the placement of
mirrors or sensing devices (espe-
cially on trucks and vans) that
would alert drivers to out-of-sight
objects could also be effective. These
would require the develop-
ment of additional automobile
safety features and regulations to
enforce compliance. Car seats, in-
fant seats, and strollers could be
designed to "alarm" when ap-
proached by a reversing vehicle.
Counseling caretakers about ade-
quate supervision and reminding
drivers to look for children before
backing up could be effective if
those behaviors could be altered
consistently.

Those interventions that
might have prevented the injuries
in our two patients, including
mirrors or sensing devices, improving
the adequacy of caretaker super-
vision, and changing driver be-

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