Paediatric Lap-belt Injury: A 7-year Experience

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FROM ABSTRACT:

Objective:
To highlight the injuries that result from lap-belt use and make recommendations for prevention, the recent experience of a regional paediatric trauma centre was reviewed.

Methods:
Retrospective review of admissions to Starship Children’s Hospital from 1996 to 2003, with significant injury following involvement in a motor vehicle crash, while wearing a lap belt.

Results:
In total, 19 patients were identified over the 7-year period.
The morbidity sustained includes:
15 patients with hollow viscus injury
13 laparotomies [injury to the abdominal wall]
7 spinal fractures
2 paraplegia
1 fatality

A total of 11 patients required laparotomy [an abdominal surgical incision to drain fluid or repair something] with a median delay of 24 h.

Of patients in the present series, 58% were aged less than 8 years and thus were inappropriately restrained.

Conclusions:
Lap-belt use can result in a range of life-threatening injuries or permanent disability in the paediatric population.

The incidence of serious lap-belt injury does not appear to be decreasing.

Morbidity and mortality could be reduced by the use of three-point restraints, age appropriate restraints and booster seats.

THESE AUTHORS ALSO NOTE:

“The introduction of seat belts in the 1950s reduced fatalities from motor vehicle crashes for both adult and paediatric occupants.”
Seat belt injuries were first described in 1956. The term, “seat belt syndrome” was first used in 1962.

“The classic triad of abdominal wall ecchymosis, visceral injury and spinal injury is most frequently seen in occupants wearing two-point lap-belt restraints.”

The inclusion criteria for this study were “age ≤ 14 years; motor vehicle crashes where the patient was restrained by a lap belt only; admission to hospital beyond the ED (i.e. patients seen in the ED and not admitted to another ward were not included).” [Important: this means that only the most severely injured children were included in this study, and less injured children were not included.]

58% of the injured children required intensive care admission (ICU).

“All patients in the present series had an abdominal CT scan.” [For this type of clinical history and presentation, an early CT scan is standard and mandatory.]

Proven injuries found at laparotomy included:
Hollow viscus perforation
Ischaemic intestinal segments
Transection of bowel
Transection of the ureter
Liver injury
Spleen injury

“18 of 19 patients were documented to have abdominal wall ecchymoses.”

37% of the injured children sustained a thoracic or lumbar spine fracture, with two patients sustaining spinal cord injury. The fractures were usually vertebral body Chance fractures, of which more than half required surgical stabilization.

“One patient sustained major vessel disruption in conjunction with hollow viscus and spinal injuries and subsequently died.”

DISCUSSION:

“Lap belts cause an injury complex that can include abdominal wall injury, visceral injury (bowel and mesentery), lumbar spine fracture (with potential for spinal cord injury), pelvic fractures and injury to the great vessels.”

“Paediatric patients using lap belts are particularly vulnerable to sustaining this injury complex.”

These authors note that “ultrasound is not an appropriate modality for the diagnosis” of these injuries, and that CT scans also often miss important injuries.

“Spinal column injuries caused by lap belts are caused by hyperflexion with distraction of the posterior spinal elements, and are relatively unique because the axis of
rotation is more anteriorly located.” This type of injury was first identified by Chance in 1948.

“These injuries [spinal Chance fractures] are often not detected by standard abdominal CT scanning, therefore, plain radiographs or CT sagittal reconstructions of the lumbar spine are required.”

“Lumbar compression fractures have also been described in children wearing lap belts.”

These authors add to the “worldwide call for their [lap belt] replacement with three-point lap and shoulder belts and age-specific restraints.” [Important]

“That seat belts save lives and reduce serious injury has been well demonstrated over many years.”

“Three-point lap and shoulder belts, child seats, and booster seats have an even greater ability to reduce morbidity and mortality than the two-point lap belt.”

The American Academy of Pediatrics recommends seating children in the back seat when possible, and using a child safety seat before progressing to a belt-positioning booster seat (with lap/shoulder belt). “This should be used until able to fit an adult seat and seat belt properly (usually at a weight greater than 35 kg [77 lbs.]).”

The major limitation in this study is that “only cases sustaining major injuries have been identified, this will serve to underestimate the morbidity sustained by our study population.” Also, cases of lap-belt injury that did not survive were not been included.

Importantly, this “study excluded cases typical of ‘seat belt syndrome’ where patients were wearing a three-point (shoulder and lap) restraint. These patients can sustain a similar spectrum of injury, particularly in children aged less than 9 years, when the lap portion of the three-point restraint is often poorly positioned and the shoulder portion might not be used correctly.”

CONCLUSIONS:

“Visceral injury (bowel and mesentery), lumbar spine fracture, pelvic fractures and injury to the great vessels need consideration when assessing patients restrained by lap belts.”

“Lap belts continue to cause significant morbidity and mortality.” The incidence of these injuries is increasing.

“This morbidity and mortality could be reduced by the use of three-point restraints, age-appropriate restraints, booster seats and harnesses.”

“Lap belts should be rapidly phased out, and resources directed towards increasing the use of age-appropriate restraints.”
KEY POINTS FROM DAN MURPHY

1) Lap-belt use can result in a range of life-threatening injuries or permanent disability in the paediatric population.

2) The incidence of serious paediatric lap-belt injuries is increasing.

3) Overall, seat belts reduce fatalities from motor vehicle crashes for both adult and paediatric occupants.

4) Seat belt injuries were first described in 1956.

5) “The classic triad of abdominal wall echymosis, visceral injury and spinal injury is most frequently seen in occupants wearing two-point lap-belt restraints.”

6) The most common initial sign indicating a serious lap belt injury is abdominal wall echymosis.

7) 37% of the injured children sustained a thoracic or lumbar spine fracture, which was usually a vertebral body Chance fracture. “These injuries [spinal Chance fractures] are often not detected by standard abdominal CT scanning, therefore, plain radiographs or CT sagittal reconstructions of the lumbar spine are required.”

8) “Lap belts cause an injury complex that can include abdominal wall injury, visceral injury (bowel and mesentery), lumbar spine fracture (with potential for spinal cord injury), pelvic fractures and injury to the great vessels.”

9) “Paediatric patients using lap belts are particularly vulnerable to sustaining this injury complex.”

10) “Ultrasound is not an appropriate modality for the diagnosis” of these injuries, and CT scans also often miss important injuries.

11) “Lumbar compression fractures have also been described in children wearing lap belts.”

12) “Lap belts continue to cause significant morbidity and mortality.”

13) “Lap belts should be rapidly phased out.”

14) Morbidity and mortality could be reduced by the use of three-point restraints, age appropriate restraints and booster seats.

Clearly, children, even restrained children, can sustain injury and be killed in motor vehicle collisions.