

# Abdominal Trauma Evaluation for the Pediatric Surgeon



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## KEYWORDS

- Pediatric trauma • Abdominal evaluation • Pediatric surgeon
- Nonoperative management solid organ injury • Abdominal injury

## KEY POINTS

- The evaluation of abdominal trauma in children should be guided by the Advanced Trauma Life Support algorithms accounting for the unique anatomy and physiology of pediatric patients.
- In children with mild trauma who are clinically stable, physical examination, laboratory results, and imaging avoiding ionizing radiation should be used; computed tomography imaging is reserved for more severe injury.
- Nonoperative management of many injuries, including solid organ trauma, has become the standard of care for children, although hemodynamically unstable patients must receive expeditious intervention.

## INTRODUCTION

Trauma is the leading cause of childhood mortality. More than 20 million children are injured each year, and unintentional injury is the leading cause of death for children in all age groups over 1 year of age. Abdominal trauma is the third leading cause of death in this population, after head and thoracic injuries. It is the most common cause of death owing to unrecognized injury.<sup>1</sup> The evaluation of the injured child with a focus on abdominal trauma is a significant portion of the practice of pediatric surgery. Pediatric trauma differs from adult trauma by mechanisms, injury patterns, anatomy, and long-term effects on growth and development. A focus on clinical examination and, when appropriate, reduction in ionizing radiation, are important considerations. We

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Disclosure: None of the authors have anything to disclose, with no commercial or financial conflicts.

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Surg Clin N Am 97 (2017) 59–74

<http://dx.doi.org/10.1016/j.suc.2016.08.004>

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focus this discussion on a systematic evaluation of injured children, centering on abdominal injuries, and highlighting areas where significant differences exist with an adult workup.

## BACKGROUND

Intraabdominal injury (IAI) can result from blunt or penetrating mechanisms. Blunt injuries are much more common than penetrating injuries (85% vs 15%). Among children with blunt abdominal trauma, 5% to 10% sustain IAI. Despite improvements in emergency diagnostics and evaluation, controversy still exists regarding the optimal assessment and management of pediatric trauma patients with IAI.

Certain mechanisms of injury are more common in the pediatric population. Infants and young children are likely to sustain injuries from motor vehicle collisions (MVC), drowning, suffocation, burns, falls, and abuse. School-aged children are susceptible to MVC, pedestrian injuries, bicycle injuries, and firearm injuries. Adolescents are at risk from MVC, firearm injuries, falls, and intentional injuries.<sup>2</sup>

Unfortunately, socioeconomic and ethnic disparities related to pediatric trauma exist and vary by age and mechanism. African Americans and Native Americans are at higher risk of fatal injuries than other ethnic groups.<sup>3</sup> Their care and outcomes also differ along these same ethnic lines. Algorithms and guidelines that aim to standardize care may work to reduce some of these disparities.

## PRESENTATION AND DIAGNOSIS

Children are more susceptible to blunt injury than adults. A smaller body size allows for a greater distribution of injury; therefore, children often suffer multiple traumatic injuries in several regions. Additionally, pediatric internal organs are more likely to be injured owing to a smaller torso, larger and more mobile viscera, and decreased amount of intraabdominal fat.<sup>4</sup>

There are several common mechanisms leading to blunt abdominal trauma in children. The leading cause is MVC, accounting for more than 50% of pediatric abdominal trauma. Physical examination findings from blunt trauma include ecchymosis, abrasions, lacerations, abdominal tenderness, or abdominal distention. The liver and spleen are the most common solid organs injured. The most concerning and often subtle finding results from abrasions or ecchymosis from restraining belts, the “seat belt sign.” When these belt marks are not over the bony pelvis, significant injury may result. The injuries can result from either the lap portion of the belt being too high or the shoulder portion being too low (**Fig. 1**). Patients with a seat belt sign are at greater risk for intraabdominal injury, particularly hollow viscus injury.<sup>5</sup> These injuries are also associated with Chance fractures, flexion–distraction injuries of the spine at the area of the lap belt, owing to limited mobility of the spine from the compressing seat belt. Chance fractures occur in about 5% of restrained children involved in an MVC.<sup>6</sup> The belts may also injure solid organs including the liver, spleen, or pancreas. We have seen several associated aortic injuries in our patient population resulting from the similar compression that causes spine fractures. These injuries can be very difficult to address in young children and should not be overlooked.

Other causes of abdominal trauma include sport injuries, bicycle and all-terrain vehicle injuries, pedestrian injuries, falls, and child abuse. Sports-related injuries are more commonly associated with isolated organ injury as a result of impact to the abdomen, in particular the spleen, kidney, and gastrointestinal tract. Although

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