

# Nonoperative Management of Blunt Solid Organ Injury in Pediatric Surgery



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## KEYWORDS

- Pediatric • Spleen injury • Liver injury • Kidney injury • Blunt trauma • Management • Review

## KEY POINTS

- Nonoperative management of blunt solid organ injury in children is achievable in a high percentage of injuries.
- Algorithms for management are important to improve care.
- Strategies for management of common complications associated with nonoperative management are reviewed.

## BACKGROUND

Of the approximately 6 million children injured last year in the United States, an estimated 9600 sustained injury to the liver, spleen, or kidney.<sup>1,2</sup> The management of blunt solid organ injury (SOI; defined as liver, spleen, or kidney injury) in children has evolved and undergone numerous changes in a relatively short time.<sup>3–8</sup> Initially, the diagnosis of SOI was solely based on physical examination and clinical judgment; operative management was frequent. However, in the 1970s, pediatric surgeons in Toronto began advocating for nonoperative management (NOM) of splenic injuries based on clinical assessment; however, adoption was slow.<sup>9</sup> As computed tomography (CT) increased in sensitivity for identifying less severe injuries, an organ injury grading system was developed by the American Association for the Surgery of Trauma (AAST) in the 1990s<sup>10</sup> (Tables 1–3). With the advent of a new organ injury scale, CT grade of injury became incorporated into the management strategy of SOI in children and adults.

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Grade	Injury Type	Description of Injury
I	Hematoma	Subcapsular, <10% surface area
	Laceration	Capsular tear, <1 cm parenchymal depth
II	Hematoma	Subcapsular, 10%–50% surface area; intraparenchymal <5 cm diameter
	Laceration	Capsular tear, 1–3 cm parenchymal depth that does not involve a trabecular vessel
III	Hematoma	Subcapsular, >50% surface area of expanding; ruptured subcapsular or parenchymal hematoma; intraparenchymal hematoma $\geq$ 5 cm or expanding
	Laceration	>3 cm parenchymal depth or involving a trabecular vessel
IV	Laceration	Laceration involving segmental or hilar vessels producing major devascularization (>25% of spleen)
V	Laceration	Completely shattered spleen
	Vascular	Hilar vascular injury with spleen devascularization

From Moore EE, Cogbill TH, Jurkovich GJ, et al. Organ injury scaling: spleen and liver (1994 revision). *J Trauma* 1995;38(3):323–4; with permission.

Outcomes, such as hospital length of stay, were then correlated with injury severity, and this led to evidence-based management strategies encouraging NOM.<sup>11</sup> The initial approach using hemodynamic status increasingly seemed to accurately determine which patients needed operation and which patients could undergo successful NOM.<sup>5,12,13</sup> This evolution continued as increased data demonstrated satisfactory outcomes for NOM even in high-grade injuries (Fig. 1). With the increasing evidence, NOM of SOI in pediatric trauma is achievable in a very high percentage of patients. This article reviews the nonoperative approach and the research supporting it.

Grade	Injury Type	Description of Injury
I	Hematoma	Subcapsular, <10% surface area
	Laceration	Capsular tear, <1 cm, parenchymal depth
II	Hematoma	Subcapsular, 10% to 50% surface area, intraparenchymal <10 cm in diameter
	Laceration	Capsular tear 1–3 cm parenchymal depth, <10 cm in length
III	Hematoma	Subcapsular, >50% surface area of ruptured subcapsular or parenchymal hematoma; intraparenchymal hematoma >10 cm or expanding
	Laceration	>3 cm parenchymal depth
IV	Laceration	Parenchymal disruption involving 25% to 75% hepatic lobe or 1–3 Couinaud segments
V	Laceration	Parenchymal disruption involving >75% of hepatic lobe or >3 Couinaud segments within a single lobe
	Vascular	Juxtahepatic venous injuries; that is, retrohepatic vena cava or central major hepatic veins
VI	Vascular	Hepatic avulsion

From Moore EE, Cogbill TH, Jurkovich GJ, et al. Organ injury scaling: spleen and liver (1994 revision). *J Trauma* 1995;38(3):323–4; with permission.

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