

Preventing outliers: circumventing non-operative management failure

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The authors present their data from an Eastern Association for the Surgery of Trauma (EAST) multicenter retrospective study evaluating the rates of non-operative management (NOM) failure for low-grade (grades 1 and 2) splenic injuries with associated contrast blush.¹ 145 patients were ultimately included for study, with 55 grade 1 injuries and 90 grade 2 injuries. NOM failure rates were 18.2% (10 of 55) and 21.1% (19 of 90) for grades 1 and 2, respectively, with 38% undergoing splenectomy and 62% undergoing angioembolization (AE). Reasons for NOM failure included: hemodynamic instability (31%), pseudoaneurysm (27.6%), decrease in hemoglobin (13.8%), hemoperitoneum (10.3%), readmission with abdominal pain (3.4%), and unknown/no indication (13.8%). Those who failed NOM had increased hospital length of stay (5 days vs. 8 days), increased rates of transfusion (25.9% vs. 55.2%) and massive transfusion (2.6% vs. 13.8%), but statistically similar intensive care unit length of stay and mortality.

This study comes on the heels of a recent update to the American Association for the Surgery of Trauma Organ Injury Scale which upgrades patients with contrast blush to grade 4, recognizing the contribution of vascular injury to the severity of solid organ injury.² Further, Zarzaur *et al* published recently regarding the history of vascular abnormality on CT imaging, citing a >40% risk of non-operative management failure if contrast extravasation is noted.³ The failure rates in this study specifically evaluating contrast blush are starkly contrasted to the seminal work done 23 years earlier by the EAST organization, with failure rates for grades 1 and 2 injuries noted at 4.8% and 9.5%, respectively.⁴ All of these data suggest that findings of a contrast blush require a different approach in management.

However, embolization is not without consequence. Morbidity is noted at 38% versus 19% in a recent systematic review of splenic AE versus NOM, with minimal effect of AE noted in grades 1–3 injuries.⁵ Interestingly, there also exists data on delayed splenic pseudoaneurysms which showed involution of approximately 50% of these vascular malformations without AE intervention.⁶ Similarly, the authors on this study note an 80% success rate of NOM in the setting of contrast blush for low-grade injury, so perhaps not all of these patients require empiric AE.

The delivery and economics of trauma care continue to drive methods towards minimally invasive/non-operative techniques with a focus on limiting unnecessary interventions. However, despite the best efforts, outliers still exist to demonstrate the flaws in our designed systems of management. Perhaps algorithmic approaches should consider dynamic testing such as empiric angiography, as suggested in one such historical algorithm, with an option for discretionary embolization if indicated/desired for patients with contrast blush.⁷ It

is possible that a different technology, angiography in real time, versus a static CT image, may allow for better differentiation of those patients most likely to suffer NOM failure, and prevent surgical rescue.

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REFERENCES

- 1 Spoor KA, Cull JD, Otaibi BW, *et al*. Failure rates of non-operative management of low grade splenic injuries with active extravasation: an Eastern Association for the surgery of trauma multi-center study. *Trauma Surg Acute Care Open* 2024.
- 2 Kozar RA, Crandall M, Shanmuganathan K, Zarzaur BL, Coburn M, Cribari C, Kaups K, Schuster K, Tominaga GT, AAST Patient Assessment Committee. Organ injury Scaling 2018 update: spleen, liver, and kidney. *J Trauma Acute Care Surg* 2018;**85**:1119–22.
- 3 Zarzaur BL, Dunn JA, Leininger B, Lauerman M, Shanmuganathan K, Kaups K, Zarny K, Hartwell JL, Bhakta A, Myers J, *et al*. Natural history of splenic vascular abnormalities after blunt injury: a Western trauma Association multicenter trial. *J Trauma Acute Care Surg* 2017;**83**:999–1005.
- 4 Peitzman AB, Heil B, Rivera L, Federle MB, Harbrecht BG, Clancy KD, Croce M, Anderson BL, Morris JA, Shatz D, *et al*. Blunt splenic injury in adults: multi-institutional study of the Eastern Association for the surgery of trauma. *J Trauma* 2000;**49**:177–87.
- 5 Crichton JCI, Naidoo K, Yet B, Brundage SI, Perkins Z. The role of splenic angioembolization as an adjunct to nonoperative management of blunt splenic injuries: a systematic review and meta-analysis. *J Trauma Acute Care Surg* 2017;**83**:934–43.
- 6 Muroya T, Ogura H, Shimizu K, Tasaki O, Kuwagata Y, Fuse T, Nakamori Y, Ito Y, Hino H, Shimazu T. Delayed formation of splenic pseudoaneurysm following nonoperative management in blunt splenic injury: multi-institutional study in Osaka, Japan. *J Trauma Acute Care Surg* 2013;**75**:417–20.
- 7 Miller PR, Chang MC, Hoth JJ, Mowery NT, Hildreth AN, Martin RS, Holmes JH, Meredith JW, Requarth JA. Prospective trial of angiography and embolization for all grade III to V blunt splenic injuries: nonoperative management success rate is significantly improved. *J Am Coll Surg* 2014;**218**:644–8.



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