

Approach to Traumatic Shock

David M. Somand

Kevin R. Ward

REFERENCES

- Kauvar DS, Lefering R, Wade CE: Impact of hemorrhage on trauma outcome: an overview of epidemiology, clinical presentations, and therapeutic considerations. *J Trauma* 60 (6 Suppl): S3, 2006. [PMID: 16763478]
- Brohi K, Cohen MJ, Ganter MT, et al: Acute coagulopathy of trauma: hypoperfusion induces systemic anticoagulation and hyperfibrinolysis. *J Trauma* 64: 1211, 2008. [PMID: 18469643]
- Maegle M, Spinella PC, Schochl H: The acute coagulopathy of trauma: mechanisms and tools for risk stratification. *Shock* 38: 450, 2012. [PMID: 23042192]
- Engstrom M, Schott U, Romner B, Reinstrup P: Acidosis impairs the coagulation: a thromboelastographic study. *J Trauma* 61: 624, 2006. [PMID: 16966998]
- Ward KR: The microcirculation: linking trauma and coagulopathy. *Transfusion* 53 (Suppl 1): 38S, 2013. [PMID: 23301971]
- Schochl H, Voelckel W, Maegle M, Solomon C: Trauma-associated hyperfibrinolysis. *Hamostaseologie* 32: 22, 2012. [PMID: 22009115]
- Mutschler M, Paffrath T, Wölfl C, et al: The ATLS(*) classification of hypovolaemic shock: a well established teaching tool on the edge? *Injury* 45 (Suppl 3): S35, 2014. [PMID: 25284231]
- Barbee RW, Reynolds PS, Ward KR: Assessing shock resuscitation strategies by oxygen debt repayment. *Shock* 33: 113, 2010. [PMID: 20081495]
- Moffatt SE: Hypothermia in trauma. *Emerg Med J* 30: 989, 2013. [PMID: 23243045]
- Bickell WH, Wall MJ Jr, Pepe PE, et al: Immediate versus delayed fluid resuscitation for hypotensive patients with penetrating torso injuries. *N Engl J Med* 331: 1105, 1994. [PMID: 7935634]
- Eastridge BJ, Salinas J, McManus JG, et al: Hypotension begins at 110 mm Hg: redefining "hypotension" with data. *J Trauma* 63: 291, 2007. [PMID: 17693826]
- Eastridge BJ, Salinas J, Wade CE, Blackburne LH: Hypotension is 100 mm Hg on the battlefield. *Am J Surg* 202: 404, 2011. [PMID: 21943946]
- Albreiki M, Voegeli D: Permissive hypotensive resuscitation in adult patients with traumatic haemorrhagic shock: a systematic review. *Eur J Trauma Emerg Surg* 44: 191, 2018. [PMID: 29079917]
- Spaite DW, Hu C, Bobrow BJ, et al: Mortality and prehospital blood pressure in patients with major traumatic brain injury: implications for the hypotension threshold. *JAMA Surg* 152: 360, 2017. [PMID: 27926759]
- Schreiber MA: The use of normal saline for resuscitation in trauma. *J Trauma* 70 (5 Suppl): S13, 2011. [PMID: 21841559]
- Semler MW, Self WH, Wanderer JP, et al; SMART Investigators and the Pragmatic Critical Care Research Group: Balanced crystalloids versus saline in critically ill adults. *N Engl J Med* 378: 829, 2018. [PMID: 2948592]
- Self WH, Semler MW, Wanderer JP, et al; SALT-ED Investigators: Balanced crystalloids versus saline in noncritically ill adults. *N Engl J Med* 378: 819, 2018. [PMID: 29485926]
- Wise R, Faurie M, Malbrain M, Hodgson E: Strategies for intravenous fluid resuscitation in trauma patients. *World J Surg* 41: 1170, 2017. [PMID: 28058475]
- Sperry JL, Guyette FX, Brown JB, et al: Prehospital Plasma during Air Medical Transport in Trauma Patients at Risk for Hemorrhagic Shock. *N Engl J Med* 379: 315, 2018. [PMID: 30044935]
- Moore HB, Moore EE, Chapman MP, et al: Plasma-first resuscitation to treat haemorrhagic shock during emergency ground transportation in an urban area: a randomised trial. *Lancet* 392: 283, 2018. [PMID: 30032977]
- Carson JL, Triulzi DJ, Ness PM: Indications for and adverse effects of red-cell transfusion. *N Engl J Med* 377: 1261, 2017. [PMID: 28953438]
- Goodnough LT, Panigrahi AK: Blood transfusion therapy. *Med Clin North Am* 101: 431, 2017. [PMID: 28189180]
- García-Roa M, Del Carmen Vicente-Ayuso M, Bobes AM, et al: Red blood cell storage time and transfusion: current practice, concerns and future perspectives. *Blood Transfus* 15: 222, 2017. [PMID: 28518049]
- Butler FK: Fluid resuscitation in tactical combat casualty care: yesterday and today. *Wilderness Environ Med* 28: S74, 2017. [PMID: 28601214]
- Harris T, Davenport R, Mak M, Brohi K: The evolving science of trauma resuscitation. *Emerg Med Clin North Am* 36: 85, 2018. [PMID: 29132583]
- Cantle PM, Cotton BA: Prediction of massive transfusion in trauma. *Crit Care Clin* 33: 71, 2017. [PMID: 27894500]
- Cotton BA, Dossett LA, Haut ER, et al: Multicenter validation of a simplified score to predict massive transfusion in trauma. *J Trauma* 69: S33, 2010. [PMID: 20622617]
- Cotton BA, Dossett LA, Haut ER, et al: Multicenter validation of a simplified score to predict massive transfusion in trauma. *J Trauma* 69 (Suppl 1): S33, 2010. [PMID: 20622617]
- Nessen SC, Eastridge BJ, Cronk D, et al: Fresh whole blood use by forward surgical teams in Afghanistan is associated with improved survival compared to component therapy without platelets. *Transfusion* 53 (Suppl 1): 107S, 2013. [PMID: 23301962]
- Rahouma M, Kamel M, Jodeh D, et al: Does a balanced transfusion ratio of plasma to packed red blood cells improve outcomes in both trauma and surgical patients? A meta-analysis of randomized controlled trials and observational studies. *Am J Surg* 216: 342, 2018. [PMID: 2896989]
- Mitra B, O'Reilly G, Cameron PA, Zatta A, Gruen RL: Effectiveness of massive transfusion protocols on mortality in trauma: a systematic review and meta-analysis. *ANZ J Surg* 83: 918, 2013. [PMID: 24147731]
- McQuilten ZK, Crighton G, Brunskill S, et al: Optimal dose, timing and ratio of blood products in massive transfusion: results from a systematic review. *Transfus Med Rev* 32: 6, 2018. [PMID: 28803752]
- Lal DS, Shaz BH: Massive transfusion: blood component ratios. *Curr Opin Hematol* 20: 521, 2013. [PMID: 24104413]
- Roberts I, Shakur H, Coats T, et al: The CRASH-2 trial: a randomised controlled trial and economic evaluation of the effects of tranexamic acid on death, vascular occlusive events and transfusion requirement in bleeding trauma patients. *Health Technol Assess* 17: 1, 2013. [PMID: 23477634]
- Cole E, Davenport R, Willett K, et al: Tranexamic acid use in severely injured civilian patients and the effects on outcomes: a prospective cohort study. *Ann Surg* 261: 390, 2015. [PMID: 25412319]
- Morrison JJ, Dubose JJ, Rasmussen TE, et al: Military application of tranexamic acid in trauma emergency resuscitation (MATTERs) study. *Arch Surg* 147: 113, 2012. [PMID: 22006852]
- Hayter MA, Pavenski K, Baker J: Massive transfusion in the trauma patient: continuing professional development. *Can J Anaesth* 59: 1130, 2012. [PMID: 23076727]
- Lier H, Krep H, Schroeder S, Stuber F: Preconditions of hemostasis in trauma: a review. The influence of acidosis, hypocalcemia, anemia, and hypothermia on functional hemostasis in trauma. *J Trauma* 65: 951, 2008. [PMID: 18849817]
- Afshari A, Wikkelsø A, Brok J, Møller AM, Wetterslev J: Thrombelastography (TEG) or thromboelastometry (ROTEM) to monitor haemotherapy versus usual care in patients with massive transfusion. *Cochrane Database Syst Rev* 3: CD007871, 2011. [PMID: 21412912]
- Gonzalez E, Moore EE, Moore HB, et al: Goal-directed hemostatic resuscitation of trauma-induced coagulopathy: a pragmatic randomized clinical trial comparing a viscoelastic assay to conventional coagulation assays. *Ann Surg* 263: 1051, 2016. [PMID: 26720428]