Management of Circulatory Compromise In Trauma Patients: Controversies and Solutions

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Massive hemorrhage due to trauma can lead to circulatory compromise that may results in death of the victim. In most of the instances it is preventable if prompt resuscitative measures are taken. The circulatory compromise leading to shock may also occur due to other causes in a trauma victim. This includes obstructive, distributive and cardiogenic shocks. All these can lead to a state of hypoperfusion and compromised oxygen delivery at cellular level. This results in anaerobic metabolism that cannot sustain life for long and finally the death of the cells takes place. This finally end up in a multi-organ failure. Many a time more than one type of shock exists in a trauma victim. However, hypovolemia due to blood loss remains on the top of the list.[1] The pathophysiological changes due to blood loss varies depending upon the nature of the insult and time elapsed since the injury. A more tailored approach is required to address the circulatory insufficiency for each trauma victim. It takes precedence over a stereotype formula based approach.[2]

The fluid management for the patient with hemorrhagic shock is a debatable subject. The research on this topic over the decades tried to provide insight about the physiological changes taking place inside the body to mitigate the effect of volume loss. Based upon this, different strategies are devised to minimize the effect of such changes. The controversy between crystalloid versus colloid fluid administration as well as the use of blood and its product is not settled yet. Research has documented that over use of crystalloid can compromise the compensatory mechanisms of the body and affect the intrinsic coagulation capacity to arrest the ongoing bleeding.[3]

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In the recent past volume based crystalloid fluid resuscitation was used to mitigate the effect of blood loss. An aggressive crystalloid fluid resuscitation approach was practiced that later found to result in more damage. The lethal triad of coagulopathy, acidosis and hypothermia led to a high mortality. The fluid overload also compromised the cardio-pulmonary status. The excess fluid used caused compartment syndrome and impaired functions of gastrointestinal tract and other organ systems. The concept of permissive hypotension was then introduced to mitigate the effect of fluid overload. A systolic blood pressure of up to 90mmHg was set as a target for penetrating trauma. However, it was different for blunt trauma and when brain injury was also present. The resuscitation measures were tailored according to the need of the victim in context of mode of injury. Over the ensuing years there was also a debate if volume resuscitation can be more conservative in pre-hospital setting. This was based upon the data that showed high mortality in victims who received aggressive fluid resuscitation in the field. A concept of “scoop and run” was therefore suggested.[4]

The current trend is towards more restrictive use of crystalloids in a trauma setting for restoring circulatory volume due to hemorrhage. This is the key take away from number research articles on this subject. Early use of whole blood is ideal when hemorrhage is suspected as a cause of shock. In case of non-availability of whole blood, red cells, plasma, platelets and other blood products may be used in different ratios guided by the clinical judgment and coagulation profile investigations. It is recommended to limit the use of crystalloids to a minimum. However, when blood and its products cannot be arranged on urgent basis then they may be infused. According to the current 11th edition provider manual ATLS protocol 250-500 ml may be used in adult trauma victims initially. All fluids must be warmed to 39^{0}C to prevent hypothermia and its related consequences. For children less than seven years of age the amount of crystalloids used should be based upon the weight and recommended volume to be used is 10ml/Kg. Guidelines are also available for the use of type of

blood group in emergency scenarios. In a dire situation group O packed cells along with AB plasma can be transfused till cross-matched products are available. Considerations must be given for Rh negative status of the patient.[5-7.]

There are many gray areas about which evidence is still evolving. This is evident by finding differences in the outcome for patients with penetrating injury in comparison with those who sustain blunt trauma. For later guidelines are not clear. A systolic blood pressure of 90 mmHg is targeted for patients with the penetrating injury. However, in victims of traumatic brain injury a higher systolic pressure of 110 mmHg is suggested as autoregulation mechanism is affected. Same approach is applicable to victims of older age, those with hypertension and in whom spinal cord injury is suspected.[8] Research on the subject of trauma is an ongoing process. As per new information guidelines are revised. Therefore, those who deal with trauma patients must update their knowledge on regular basis. However, the control of bleeding should be the goal of treatment and every effort be made to achieve it in a timely manner.

REFERENCES:

1. Leech C, Turner J. Shock in Trauma. Emerg Med Clin North Am. 2023;41(1):1-17. doi: 10.1016/j.emc.2022.09.007.

2. Harris T, Davenport R, Mak M, Brohi K. The evolving science of trauma resuscitation. Emerg Med Clin North Am. 2018;36(1):85-106. doi: 10.1016/j.emc.2017.08.009.

3. Tubert P, Kalimouttou A, Bouzat P, David JS, Gauss T. Are crystalloid-based fluid expansion strategies still relevant in the first hours of trauma induced hemorrhagic shock? Crit Care. 2024 ;28(1):416. doi: 10.1186/s13054-024-05185-7.

4. Ramesh GH, Uma JC, Farhath S. Fluid resuscitation in trauma: what are the best strategies and fluids? Int J Emerg Med. 2019;12(1):38. doi: 10.1186/s12245-019-0253-8.

5. Caspers M, Maegele M, Fröhlich M. Current strategies for hemostatic control in acute trauma hemorrhage and trauma-induced coagulopathy. Expert Rev Hematol. 2018;11(12):987-95. doi: 10.1080/17474086.2018.1548929.

6. Kemp Bohan PM, McCarthy PM, Wall ME, Adams AM, Chick RC, Forcum JE et al. Safety and efficacy of low-titer O whole blood resuscitation in a civilian level I trauma center. J Trauma Acute Care Surg. 2021;91(2S):S162-68. doi: 10.1097/TA.0000000000003289.

7. Coulthard SL, Kaplan LJ, Cannon JW. What's new in whole blood resuscitation? In the trauma bay and beyond. Curr Opin Crit Care. 2024;30(3):209-16. doi: 10.1097/MCC.0000000000001140.

8. Committee on trauma, Course manual, Advanced Trauma Life Support® (ATLS®), 11th Edition. American College of Surgeons 633 N. Saint Clair Street, Chicago, IL 2025.

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