



Effect of Prehospital Low-Titer O+ Whole Blood Administration on Vitals, Shock Index, and Delta Shock in Blunt and Penetrating Trauma Patients

Yevgeniy Maksimenko MD NRP¹, David Wampler PhD LP FAEMS², Bryan Everitt MD NRP², Jessica Wentling DO FAAEM FACEP², Mark Dieterle MBA NRP LP², William Bullock EMT-P³, Michael Stringfellow EMT-P³, Katherine Raczek MD², Christopher J. Winckler MD LP²

1 - SAUSHEC Military EMS & Disaster Medicine Fellowship; 2 - UT Health San Antonio, Departments of Emergency Medicine and Emergency Health Sciences; 3- San Antonio Fire Department



INTRODUCTION

- Hemorrhagic shock is a leading cause of death from trauma in the prehospital setting
- Shock index (SI) (= heart rate / systolic blood pressure) > 0.9 is an independent predictor of mortality in trauma
- Prehospital blood product administration is becoming more common and accessible, although limited data exists for the use of low-titer O+ whole blood (WB) in the management of hemorrhagic shock in the field

STUDY GOAL

- The goal of this study was to evaluate changes in vitals, shock index (SI), and delta SI in penetrating and blunt trauma patients before and after receiving prehospital low-titer O+ WB (LTO+WB)

METHODS

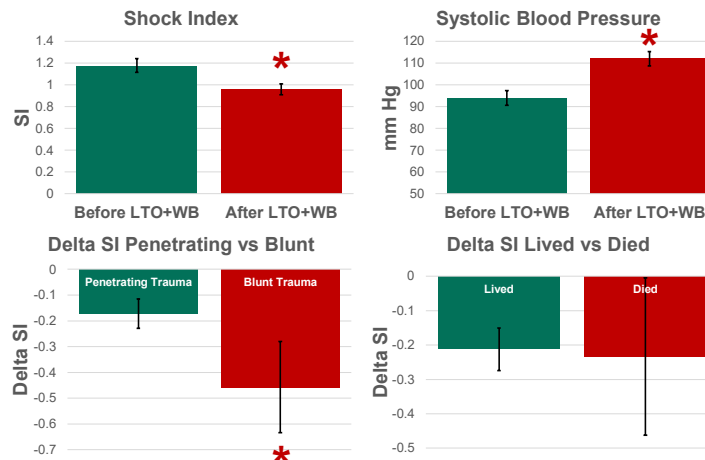
- A quantitative descriptive study utilizing the San Antonio Fire Department CQI registry of WB administration
- Data collection time period: October 2018 to June 2021
- A total of 490 trauma patients received prehospital WB; 194 excluded due to incomplete data; final sample of 296 patients: 244 with penetrating and 52 with blunt trauma
- Analysis performed utilizing descriptive statistics and two-tailed t-test for continuous data

INCLUSION CRITERIA	Mechanism of Injury = blunt and/or penetrating trauma
EXCLUSION CRITERIA	Non-traumatic indications for WB administration
PRIMARY OUTCOME	SI before and after WB administration
SECONDARY OUTCOMES	Systolic blood pressure (SBP), heart rate (HR), survival to hospital discharge, delta SI

RESULTS

- **SI significantly decreased** in trauma all-comers (1.18±0.56, 95%CI [1.11, 1.24] vs. 0.96±0.44, 95%CI [0.91, 1.01])
- Delta SI change in trauma all comers was -0.218±0.5, 95%CI [-0.275, -0.161]
- **SBP significantly increased** in trauma all-comers (94±30 mmHg, 95%CI [91, 97.7] vs. 112±29 mmHg, 95%CI [108, 115])
- *No significant change in HR* was found in trauma all-comers (100±27/min, 95%CI [97-103] vs. 98±27/min, 95%CI [95-101])
- **Delta SI significantly decreased** in blunt trauma patients compared to the penetrating trauma sample (-0.458, 95%CI [-0.635, -0.281] vs. -0.172, 95%CI [-0.229, -0.115])
- *No difference was seen in the delta SI* when patients were dichotomized on outcome = lived/died (-0.21±0.48, 95%CI [-0.274, -0.151] vs. -0.23±0.63, 95%CI [-0.463, -0.00458])
- Out of the 260 patients for whom survival data was available, **231 (88.8%)** survived to hospital discharge.

Effect of LTO+WB Administration in Trauma Patients



CONCLUSIONS

- Prehospital WB administration for traumatic hemorrhagic shock was associated with decreased shock index, increased blood pressure, and decreased delta SI in blunt trauma when compared to penetrating trauma, while showing no significant improvement in heart rate or respiratory rate.
- We were not able to demonstrate a significant delta SI change between trauma patients that lived and those that died, possibly due to the low number of patients that had died in our dataset.
- Our data demonstrates the benefits of blood administration for hemorrhaging trauma patients through improvements in physiological markers and demonstrates a potential benefit to blunt trauma patients that needs to be further investigated.

LIMITATIONS

- Our database contained a large number of patients with incomplete and potentially spurious data. This is likely due to operational challenges in recording accurate vitals in severely injured patients on scene and possible recall bias.
- Our study was underpowered to show that delta SI would improve in patients that lived vs those that died after receiving LTO+WB.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the hard work of the San Antonio Fire Department and thank the South Texas Blood and Tissue Center for their diligence in exchanging and restocking our prehospital supply of Low Titer O+ WB.

DISCLAIMER

The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its Components.