Is the shock index based classification of hypovolemic shock applicable in multiple injured patients with severe traumatic brain injury?—an analysis of the TraumaRegister DGU®

Matthias Fröhlich1,6*, Arne Driessen1,6, Andreas Böhmer3,6, Ulrike Nienaber4,6, Alhadi Igressa5,6, Christian Probst1,6, Bertil Bouillon1,6, Marc Maegle1,6, Manuel Mutschler1,6 and the TraumaRegister DGU®

Abstract

Background: A new classification of hypovolemic shock based on the shock index (SI) was proposed in 2013. This classification contains four classes of shock and shows good correlation with acidosis, blood product need and mortality. Since their applicability was questioned, the aim of this study was to verify the validity of the new classification in multiple injured patients with traumatic brain injury.

Methods: Between 2002 and 2013, data from 40 888 patients from the TraumaRegister DGU® were analysed. Patients were classified according to their initial SI at hospital admission (Class I: SI < 0.6, class II: SI ≥ 0.6 to < 1.0, class III SI ≥ 1.0 to < 1.4, class IV: SI ≥ 1.4). Patients with an additional severe TBI (AIS ≥ 3) were compared to patients without severe TBI.

Results: 16,760 multiple injured patients with TBI (AIShead ≥ 3) were compared to 24,128 patients without severe TBI. With worsening of SI class, mortality rate increased from 20 to 53% in TBI patients. Worsening SI classes were associated with decreased haemoglobin, platelet counts and Quick’s values. The number of blood units transfused correlated with worsening of SI. Massive transfusion rates increased from 3% in class I to 46% in class IV. The accuracy for predicting transfusion requirements did not differ between TBI and Non TBI patients.

Discussion: The use of the SI based classification enables a quick assessment of patients in hypovolemic shock based on universally available parameters. Although the pathophysiology in TBI and Non TBI patients and early treatment methods such as the use of vasopressors differ, both groups showed an identical probability of receiving blood products within the respective SI class.

Conclusion: Regardless of the presence of TBI, the classification of hypovolemic shock based on the SI enables a fast and reliable assessment of hypovolemic shock in the emergency department. Therefore, the presented study supports the SI as a feasible tool to assess patients at risk for blood product transfusions, even in the presence of severe TBI.

Keywords: Haemorrhagic shock, Shock index, Traumatic brain injury, Multiple trauma

* Correspondence: froehlichm@uniklinik-koeln.de
1 Department of Orthopaedic Surgery, Traumatology and Sports
2 Traumatology, Cologne-Merheim Medical Centre (CMMC), Witten/Herdecke
3 University, Ostermerheimer Str. 200, D-51109 Cologne, Germany
4 Institute for Research in Operative Medicine (IFOM), University of Witten/Herdecke, Cologne Merheim Medical Center (CMMC), Ostermerheimerstr.200, D-51109 Cologne, Germany
5 Full list of author information is available at the end of the article

© The Author(s) 2016 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.