

DCR and EVTm: The Future of Trauma Research and Training

Mansoor Ali Khan PhD FRCS FACS^{1,2,3}, Bryan Cotton MD FACS^{1,2,4},
Tal Hörer MD PhD^{1,2,5} and Juan Duschesne MD FACS^{1,2,6}

¹Damage Control Resuscitation Organisation, New Orleans, USA

²Endovascular Resuscitation and Trauma Management Organisation, Örebro, Sweden

³Brighton and Sussex University Hospitals, UK

⁴Red Duke Trauma Institute, Memorial Hermann Hospital, USA

⁵Department of Cardiothoracic and Vascular Surgery and Department of Surgery, Life Science Faculty, Örebro University Hospital, Örebro University, Sweden

⁶Department of Surgery, Tulane University School of Medicine, USA

The term *damage control* comes from the United States Navy's system of rapidly deploying measures to maintain or restore a ship's integrity when damaged, to allow it to safely exit from hostile environments, and to definitively repair damages so that it might 'live to fight another day.' The individuals responsible for delivering damage control aboard such vessels are called damage controlmen and are described within their manuals as *emergency repair specialists*. These individuals provide efforts related to damage control, ship stability, and more. They also instruct other naval personnel in the methods of damage control and in the repair of damage control equipment and systems. The damage control manuals are exhaustive as is the training of these individuals.

Following on from this philosophy, the trauma community adopted the damage control surgery approach [1] to major haemorrhages resulting from penetrating abdominal trauma. This soon gained traction in managing all patients who had suffered significant physiological insult after major trauma. The concept was a major diversion at the time, going against the traditional teachings of restoring anatomy at the initial (and only) surgery. Damage control focused on restoration of physiology first, irrespective of the degree of anatomical insult.

Internationally, over the past few decades, surgery has become more and more specialised with individuals losing their general surgical skills. This, alongside the reduction in hours, affects the delivery of comprehen-

sive care to the trauma patient as individuals may lack both the clinical skills and relevant exposure to the vast array of traumatic insults [2]. To help mitigate this phenomenon and to aid the appropriate theoretical and manual training of this philosophy, the Damage Control Resuscitation (DCR) organisation was established. The purpose of the organisation is to promote trauma and emergency surgery as a specialty, where possible, and to promote the tenets of DCR through a multi-disciplinary team in areas where a singular specialty is not sustainable. To accomplish both, the DCR organisation has set out to establish best practices based on up to date scientific research and expert consensus statements.

Up until the turn of the century, the mainstay of control of the haemorrhaging vessel remained extra-vascular with extra-luminal compression or clamping. DCR recognises that in order to optimally manage the patient, all 'arrows in the quiver' must be utilised. To this end, a collaboration was established with the Endovascular Resuscitation and Trauma Management (EVTm) organisation, who are internationally renowned in pioneering and promoting evidence based endovascular management of trauma. This relationship has already made important contributions to the literature [3–7], and will no doubt continue to do so. The joint aim remains to restore the field to 'Big T' status, training surgeons to care for any injury, head to toe, and help them achieve full *Emergency Repair Specialist* status.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Corresponding author:

Tal Hörer, MD PhD, Department of Cardiothoracic and Vascular Surgery and Department of Surgery, Life Science Faculty, Örebro University Hospital, Örebro University, Sweden.

Email: tal.horer@regionorebrolan.se

© 2020 CC BY 4.0 – in cooperation with Depts. of Cardiothoracic/ Vascular Surgery, General Surgery and Anesthesia, Örebro University Hospital and Örebro University, Sweden

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

REFERENCES

- [1] Rotondo MF, Schwab CW, McGonigal MD, et al. 'Damage control': an approach for improved survival in exsanguinating penetrating abdominal injury. *J Trauma*. 1993;35(3):375–82, discussion 382–3.
- [2] Khan MA and M. McMonagle. *Trauma: code red: companion to the RCSEng definitive surgical trauma skills course*. Boca Raton, FL: CRC Press; 2018.
- [3] Duchesne J, Taghavi S, Houghton A, et al. Prehospital mortality due to hemorrhagic shock remains high and unchanged: a summary of current civilian EMS practices and new military changes. *Shock*. 2020; *In Press*. doi: 10.1097/SHK.0000000000001522.
- [4] Hörer TM, Pirouzram A, Khan M, et al. Endovascular resuscitation and trauma management (EVTM)-practical aspects and implementation. *Shock*. 2020; *In Press*. doi: 10.1097/SHK.0000000000001529.
- [5] Kauvar D, Cotton B, Khan M, et al. Circulatory trauma: a paradigm for understanding the role of endovascular therapy in hemorrhage control. *Shock*, 2020; *In Press*. doi: 10.1097/SHK.0000000000001513.
- [6] Kauvar D, Cotton B, Khan M, et al. Challenges and opportunities for endovascular treatment of hemorrhage in combat casualty care. *Shock*, 2020; *In Press*. doi: 10.1097/SHK.0000000000001514.
- [7] Tatum D, Duchesne J, Pereira B, et al. Time to hemorrhage control in a hybrid er system: is it time to change? *Shock*. 2020; *In Press*. doi: 10.1097/SHK.0000000000001539.