

Why Don't Trauma Surgeons use Resuscitative Endovascular Balloon Occlusion of the Aorta: Evidence, Holy Grail or Fear?

Kessel–Khan Corner

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Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is an additional tool for the management of non-compressible torso hemorrhage in certain selected patients. Over the last decade, REBOA has gained widespread utilization in several trauma centers worldwide, and some promising publications have supported its effectiveness in various clinical scenarios [1,2]. Moreover, the American College of Surgeons Committee on Trauma (ACSCoT) clearly states that REBOA is currently standard practice for a select patient group at a small number of trauma centers, where surgeons are immediately available for the management of REBOA [3].

However, the review of the current literature has shown that most trauma surgeons who work in hospitals with the necessary facilities for the utilization of REBOA do not use it. We agree that currently there is no high-level evidence that clearly demonstrates REBOA improves outcomes or survival compared to standard treatment of severe hemorrhage. Even in the management of severe pelvic fractures, recommendations regarding REBOA use for pelvic fracture management vary across published guidelines. For example, the last Eastern Association for the Surgeon of Trauma (EAST) recommendations do not include the utilization of REBOA [4]. The Trauma Quality Improvement Project endorses REBOA as a potential alternative initial intervention, or in addition to preperitoneal pelvic packing in

patients in extremis solely from pelvic bleeding [5]. Contemporarily, the World Society of Emergency Surgery (WSES) guidelines list REBOA as one of the first lines of treatment for severe hemodynamically unstable pelvic fractures [6].

Despite this current academic and institutional support, a prospective cross-sectional survey, including all 158 trauma medical directors at ACSCoT-verified Level I Trauma Centers, showed that a small number of trauma directors authorize the usage of REBOA [7]. In injuries other than isolated pelvic fractures, the rate of REBOA utilization is even less.

In this inaugural Kessel–Khan Corner, we try to analyze why trauma surgeons are still apprehensive of using REBOA. As with all explanations in modern medicine, the reasons are invariably multifactorial. There is a lack of sufficient high-quality prospective studies and potential perceived bias due to industry promotion. Significant numbers of our academic and clinical colleagues prefer to practice solely supported by evidence-based medicine (EBM). However, it should be emphasized that this is the nirvana that one should aspire to and certainly is the right direction to go. However, in our Corner we wish to raise again the endless discussion regarding the true value of EBM in our practice. One can argue that an appropriate balance between strict guidance to aid in the decision-making process and deciding what is best for our patients must be reached based on rational thinking and personal experience – thus making medicine more of an art. The hemorrhaging patient does not read medical articles and has no idea about score matching analysis. If REBOA is a potential way to save their life, we need to do this.

We believe that an additional reason for limited REBOA use is a misunderstanding of the concept. Many trauma surgeons still believe that REBOA was implemented to replace resuscitate thoracotomy and open

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aortic clamping. There are several publications demonstrating that patients who underwent REBOA had no improved mortality compared with Resuscitative Thoracotomy (RT) [8,9]. The experience in performing RT is much more extensive than REBOA utilization as RT has been practiced for decades. However, we believe that a major impact of REBOA use is not in patients who need RT, but when properly timed balloon inflation prevents rapid deterioration, which requires RT. The study by Brenner and her colleagues on nearly 300 trauma patients clearly demonstrated the survival benefit of REBOA over RT, particularly in patients not requiring CPR [10].

In only a minority of trauma centers are trauma surgeons sufficiently trained enough to perform REBOA. To the best of our knowledge, in a significant proportion of the hospitals, vascular surgeons or interventional radiologists perform REBOA. We may only assume that such a dependence on these specialties, a lack of their immediate availability, insufficient REBOA use by trauma surgeons, and a lack of systemic thinking and implementation of REBOA may add to the apprehension of its usage and affect outcomes. It is a well-known phenomenon in the Western world that the fear to cope with risk management results in apprehension of utilization, enforced by trials that report higher risks of mortality in REBOA patients and devastating, life-threatening complications such as leg amputations [11].

However, it is imperative to enforce that REBOA is a system technique and not reliant on the individual. It is a bridge to definitive control or intervention. This is best undertaken in trauma centers where a system is in place that has around-the-clock availability of necessary personnel for the right indication. The right indications are still up for debate, but one can say that surgery is an art as well as a science, with no patients being the same. Therefore, the indications can be patient-specific, based on the judgement of a highly trained team managing the patient to the best of their ability, ensuring that they uphold the medical value of doing no harm – “primum non nocere”.

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.

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] Moore LJ, Brenner M, Kozar RA, et al. Implementation of resuscitative endovascular balloon occlusion of the aorta as an alternative to resuscitative thoracotomy for noncompressible truncal hemorrhage. *J Trauma Acute Care Surg.* 2015;79:523–32.
- [2] DuBose JJ, Scalea TM, Brenner M, et al. The AAST prospective Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) registry: data on contemporary utilization and outcomes of aortic occlusion and resuscitative balloon occlusion of the aorta (REBOA). *J Trauma Acute Care Surg.* 2016;81:409–19.
- [3] Brenner M, Bulger EM, Perina DG, et al. Joint statement from the American College of Surgeons Committee on Trauma (ACS COT) and the American College of Emergency Physicians (ACEP) regarding the clinical use of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA). *Trauma Surg Acute Care Open.* 2018;3:e000154.
- [4] Cullinane DC, Schiller HJ, Zielinski MD, et al. Eastern Association for the Surgery of Trauma practice management guidelines for hemorrhage in pelvic fracture – update and systematic review. *J Trauma.* 2011;71:1850–68.
- [5] American College of Surgeons. Best practices in the management of orthopaedic trauma. 2015. https://www.facs.org/media/mkbnhqtq/ortho_guidelines.pdf. Accessed 7 March 2018.
- [6] Cocolini F, Stahel PF, Montori G, et al. Pelvic trauma: WSES classification and guidelines. *World J Emerg Surg.* 2017;12:1–18.
- [7] Jarvis S, Kelly M, Mains C, et al. A descriptive survey on the use of resuscitative endovascular balloon occlusion of the aorta (REBOA) for pelvic fractures at US level I trauma centers. *Patient Saf Surg.* 2019;13:43.
- [8] Castellini G, Gianola S, Biffi A, et al. Resuscitative endovascular balloon occlusion of the aorta (REBOA) in patients with major trauma and uncontrolled haemorrhagic shock: a systematic review with meta-analysis. *World J Emerg Surg.* 2021;16:41.
- [9] Khalid S, Khatri M, Siddiqui MS, Ahmed J. Resuscitative endovascular balloon occlusion of aorta versus aortic cross-clamping by thoracotomy for noncompressible torso hemorrhage: a meta-analysis. *J Surg Res.* 2022;270:252–60.
- [10] Brenner M, Inaba K, Aiolfi A, et al. Resuscitative endovascular balloon occlusion of the aorta and resuscitative thoracotomy in select patients with hemorrhagic shock: early results from the American Association for the Surgery of Trauma’s Aortic Occlusion in Resuscitation for Trauma and Acute Care Surgery registry. *J Am Coll Surg.* 2018;226:730–40.
- [11] Joseph B, Zeeshan M, Sakran JV, et al. Nationwide analysis of resuscitative endovascular balloon occlusion of the aorta in civilian trauma. *JAMA Surg.* 2019;154:500–8.