

Introduction

Many of the readers of this text have been inspired by “Top Knife”, a great book by Mattox and Hirshberg that has provided many surgeons with great approaches to the open surgical management of bleeding trauma victims. In “Top Stent”, we have aspired to develop a similarly useful resource that is applicable for the modern era of **EndoVascular hybrid Trauma and bleeding Management (EVTM)**. Although stents and stent grafts do not encompass the entirety of EVT capabilities, we have called this text “Top stent”.



Why is this text necessary? In the last 20 years, the use of endovascular capabilities for trauma applications has continued to expand. While the use of modern endovascular treatment modalities for bleeding patients began with the treatment of aortic aneurysmal disease, it has since spread into trauma care. In truth, there are anecdotal reports of centres treating bleeding patients with basic endovascular methods for many years, but the continued evolution of technologies and the arrival of the “endovascular era” has heralded a new age for the use of EVT approaches. Advances in devices utilized in modern endovascular treatment, as well as improved diagnostic tools (CT and ultrasound, angiography, Doppler etc.), have resulted in the increased utilization of EVT approaches all over the world. There is today a great variety of rapid diagnostic capabilities and endovascular tools suitable for use in a wide variety of clinical trauma scenarios. As a community, there is a need to better share lessons learned from these applications, and collaborate to define the optimal utilization of EVT principles.

It must be recognized that, at this time, endovascular therapies continue to be viewed as complementary elements of initial trauma care. This is evident in both daily practice and general trauma guidelines such as the American College of Surgeons Advanced Trauma Life Support™ guidelines as well as other guidelines. With continued experience, however, the collaborators of this text believe that EVT is poised to become an integral element on trauma care in the earliest phases after injury. In brief, we envision that **EVT represents a paradigm shift in trauma care**. It should be, and already is in some places,



part of the initial treatment algorithm of the trauma patient, and combined with open surgery, as part of the hybrid concept. In other words, EVT can be incorporated into the primary management of the trauma patient, already from the emergency room, on arrival. Probably, it could be established in the battlefield or, even in selected cases, in pre-hospital care.

Valuable examples of this paradigm shift are emerging from leading centres throughout the world. An important emerging example is the use of Aortic Balloon Occlusion (ABO) or Resuscitative Endovascular Balloon Occlusion of the Aorta (**REBOA** – the term we will utilize for Aortic balloon occlusion throughout this text). REBOA (“the new kid on the block”) is being used now in many centres to gain hemodynamic temporary stability in severely injured trauma victims- even replacing to some extent traditional resuscitative thoracotomy.

The basic technologies necessary for REBOA and EVT can, in most instances, be found in the majority of hospitals treating trauma victims. There remains a need, however, to better define the questions of “When”, “Where” and “How” these approaches should be optimally utilized. A multidisciplinary approach to answering these questions is required – combining the existing knowledge of trauma surgeons, vascular surgeons, interventional radiologists, thoracic surgeons, orthopaedic surgeons, medics, emergency medicine and anaesthesiologists. While the utilization of EVT principles will be dictated by many variables (local capabilities and local egos and credentials to name but a few) we believe that the effective integration of EVT principles into modern trauma care will require the development and maintenance of multi-disciplinary, multi-national and multi-institutional collaborations.

This “manual” represents the **personal view of a small, but dedicated group of EVT professionals** gathered to document how they think and act in the management of trauma and bleeding patients. These are all doctors with “blood on their hands”, meaning they are active clinicians and working within this field. This text is the result of their efforts to cooperate and gather ideas on how to effectively conduct EVT. There are probably many other ways of doing things, and time will show if some of the things we do, or want to do, are correct. As with all procedure-based interventions, there is less likely “one perfect way”, and more likely several safe and effective approaches to any specific EVT challenge. In Top Stent, we will not mention references

or discuss any evidence, that the reader can find elsewhere. We will only give a personal view and try to outline hard learned “tips and tricks” of our collective experience with EVTm. You, the reader, must filter this information and decide what is acceptable, doable, and **what would fit your workplace and your environment**. It is also very important to recognize that EVTm does not replace open surgery, but combines with it into a comprehensive system of trauma care capability. In some cases, the only and best treatment is the “good old” open surgical exposure and bleeding control!

You might also notice that in this manual, different parts are written in different styles, which we tried to merge during the editing process. We find it important though, that different experts express their views and tips in a collective format – and adopted this format accordingly. The combination of different nationalities and conversion of a variety of native tongues into English represented an additional challenge, – but we hope the reader will appreciate, as we do, that language should not be an obstacle to knowledge sharing. At times you might feel that some points are repeated, but we find it useful as it reflects many authors’ views in a text collection. We should also mention that, despite the frequent possible use of masculine pronouns (“he”) – EVTm is and will always be gender, race and ethnicity blind. We are all “one” in the use of EVTm principles. We should mention that this text is not a consensus but a collection of expert opinions gathered into a manual friendly format. As so, the manual is done on a goodwill basis, with no economical compensation provided to any contributor. Feel free to use it as a resource as you see fit or even to distribute the material herein. We only request that as you cite or use the opinions or discussion of our work, that you refer to “Top Stent” as your source. This will be the first, or Beta edition of this manual. We hope to develop it further in the coming years, including through the use of other platforms such as www.jevtm.com.

In our view, there is no right or wrong as long as you collaborate to achieve the ultimate goal of every trauma provider, i.e. **saving life!** So, let’s see if you think it has been worthwhile producing this first version of Top Stent. You will be the judge. Enjoy.

The authors