Editorial

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Endovascular Evolution: Transforming rAAA and Trauma Care through Innovation and Collaboration

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The management of ruptured abdominal aortic aneurysms (rAAAs) has undergone a remarkable transformation over the past three decades, driven by a relentless pursuit of better outcomes through innovation [1,2]. Historically dominated by open aortic surgery (OAS), which carried high perioperative morbidity and mortality rates, the introduction of endovascular aneurysm repair (EVAR) in the 1990s marked a paradigm shift [3,4]. This minimally invasive approach redefined possibilities in vascular surgery, enabling aneurysm exclusion without extensive surgical dissection. Initial skepticism gradually diminished as EVAR opened the door to treating patients once deemed inoperable, with pioneering centers like Zurich and Örebro demonstrating its feasibility even in challenging cases [2]. Over the last decade, EVAR for rAAA has become the standard of care in many institutions, now proven effective for all rAAA cases while maintaining low mortality rates and reducing the proportion of inoperable patients to just 3.5% [5].

This progress, however, did not come without its challenges. Anatomical constraints, such as short or angulated necks, continue to pose barriers in many centers for broader EVAR applicability. Moreover, higher rates of reintervention due to endoleaks have been noted, sparking ongoing debates about long-term durability and cost-effectiveness [6]. Yet, the advantages of EVAR, with reduced recovery times, minimized physiological insult, and lower perioperative mortality, have firmly established its role in rAAA management [7,8]. Importantly, advancements in adjunct techniques, such as aortic balloon occlusion, parallel grafts, and physician-modified, fenestrated, and branched stent grafts, continue to expand its applicability, ensuring that even patients with complex anatomies can benefit.

Drawing parallels between the evolution of rAAA management and other resuscitation advancements, the development of resuscitative endovascular balloon occlusion of the aorta (REBOA) further underscores the transformative potential of endovascular technology [9]. The evolution of REBOA mirrors that of EVAR, with advancements in device design and deployment improving its safety and utility over time. The EndoVascular resuscitation and Trauma Management (EVTM) concept has also emphasized the utility of other endovascular tools, such as stent graft placement and embolization, for managing hemodynamically unstable patients, now often serving as critical adjuncts in emergency care [10]. Additionally, emerging biomarkers hold great promise in guiding treatment decisions, not only for rAAA management but also for optimizing the use of REBOA. These biomarkers provide critical insights into patient inflammation and immune status, aiding clinicians in stratifying risk, determining the optimal timing for intervention, and tailoring strategies to stabilize patients effectively. This approach enhances treatment strategies and can further improve outcomes [11].

Beyond their technical innovations, these advancements exemplify the power of multidisciplinary collaboration. Vascular and trauma surgeons, interventional radiologists, and anesthesiologists have worked together to refine these techniques and integrate them into broader care pathways, streamlining all aspects of initial evaluation, diagnostics, and definitive management. Workshops and training programs, such-as those offered by EVTM, have been instrumental in fostering cross-disciplinary expertise, ensuring that the next generation of clinicians is well-equipped to leverage these tools effectively [12]. Looking ahead, the potential for endovascular solutions to revolutionize vascular and trauma care is immense. Next-generation stent grafts promise improved sealing and fixation, addressing current limitations in EVAR. Similarly, advancements in imaging technology and AI-driven decision-making tools are likely to enhance precision in device deployment and patient selection [13]. At the same time, expanding access to life-saving

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technologies like EVAR and REBOA remains a critical challenge. Policies promoting affordability, investments in hybrid operating rooms, and training initiatives will be key to ensuring that these benefits reach all patients who need them, enabling broader access across different healthcare systems and geographic regions. Continued research and robust clinical trials will be essential to refine indications, improve long-term outcomes, and address lingering questions about cost-effectiveness.

By embracing these innovations and addressing these challenges together, we can continue to push the boundaries of what is achievable, ensuring that endovascular advancements translate into improved outcomes and broader accessibility, with opportunities to further reduce suffering and save lives.

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 author declares that they have no conflicts of interest.

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