Commentary: Aortic balloon occlusion of the frozen elephant trunk in acute type A aortic dissection: From "making virtue of necessity" to "uncertain virtuosism"

Giacomo Murana, MD, PhD, Luca Botta, MD, PhD, Alessandro Leone, MD, PhD, Luca Di Marco, MD, PhD, and Davide Pacini, MD, PhD

From the Cardiac Surgery Unit, Cardio-Thoraco-Vascular Department, S. Orsola Hospital, University of Bologna, Bologna, Italy.

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Address for reprints: Davide Pacini, MD, PhD, Cardiac Surgery Unit, Cardio-Thoraco-Vascular Department, S. Orsola Hospital, University of Bologna, Via Massarenti 9, 40138, Bologna, Italy (E-mail: davide.pacini@unibo.it or davide.pacini@aosp.bo.it).

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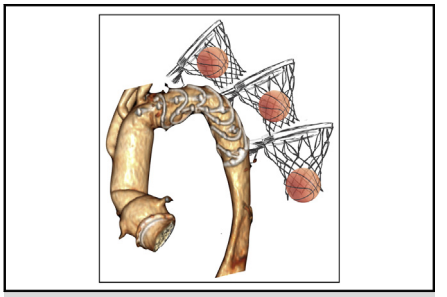

The balloon occlusion: the right balloon in the right basket.

Central Message

Balloon occlusion of the stent into the descending thoracic aorta during an FET procedure allows a reduced visceral ischemic time but adds complexity to the operation and does not change the outcomes in acute type A dissections.

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Acute type A aortic dissection is a detrimental disease despite surgical therapy. Recently, the possibility to be more radical and curative using the frozen elephant trunk (FET) procedure allows replacement of the arch from entry tears, remodeling the descending and—sometimes the abdominal aorta—in a 1-step procedure.[1,2] However, there are 2 main issues related to this technique: the procedural complexity in an acute setting and the risk of distal malperfusion after flow rerouting between the true and false lumen.

In this issue of *The Journal of Thoracic and Cardiovascular Surgery*, Liu and coworkers proposed an attractive adjunct of the FET technique in case of acute type A aortic dissection.[3] In particular, after stent graft release into the true lumen of the descending thoracic aorta, an aortic balloon was deployed in the stented portion of the graft and filled with saline to occlude and avoid displacement while perfusion of the lower body was resumed through the femoral artery. The possibility to occlude the thoracic aorta while performing the distal anastomosis in a dry surgical field has the advantage to restoring peripheral flow from the femoral artery, increase the nasopharyngeal temperature to 28°C, and shorten circulatory arrest time. In the study, the authors evaluated the efficacy of this technique matching the balloon population with a control group (FET under moderate hypothermic circulatory arrest without aortic balloon occlusion) and reported a certain protective effect on liver and kidney with similar other adverse events and mortality compared with the conventional FET technique. The idea to perform an intra-aortic balloon occlusion is not new and was reported as early as 1954 during the Korean War in patients with hemorrhagic shock. Subsequently, it was used preoperatively to control hemorrhage from a ruptured abdominal aortic aneurysm, intraoperatively for abdominal aortic aneurysm repair, and for postpartum hemorrhage.[4]

Following this principle, in vascular surgery, in case of traumatic injuries with hemorrhagic shock, the use of resuscitative endovascular balloon occlusion of the aorta represents a successful technique adopted to temporary stabilize a patient with noncompressible torso hemorrhage.[5] It could be considered a fast and effective technique to face a challenging situation. In all of these cases, the intra-aortic balloon occlusion was performed in very critical conditions "to make a virtue of necessity," according to a famous idiom found first in Chaucer's *The Knight's Tale*: "Then is it wisdom, as it seems to me, to make virtue of necessity."[6] In the report of Liu and colleagues,[3] this technique seems to add technical complexity to an already difficult operation in the acute setting. Some doubts arise about balloon sealing into the stent, which requires a sort of oversize of the acute flap with the risk of new entry tears. Other issues—not considered by the authors—are the number of distal tears, the possible rupture of the balloon, and the backflow of the blood coming from the false lumen. In addition, the management of extracorporeal circulation, cerebral perfusion, and distal perfusion might require an experienced perfusionist, not always available during the night… New technical details can be helpful for the

evolution of this operation but, according to the results of Liu and colleagues, we are not able to see a clear advantage of the intra-aortic balloon occlusion during the FET procedure in terms of clinical outcomes. This study has other evident limitations like patient and matching selection, the absence of complete anatomic parameters, and of a propensity matching analysis.

Unfortunately, the report of Liu and colleagues is not able to solve the main issues about use of the FET procedure in acute type A aortic dissection because the balloon occlusion technique adds complexity to a still demanding procedure and does not modify the outcomes in terms of visceral malperfusion. This new adjunct for the FET technique needs to be validated in more robust studies with more selective inclusion criteria to gain a full acceptance and therefore, until now, it appears to be more an ''uncertain virtuosism'' than ''a virtue of necessity.''

References

1. Di Marco L, Leone A, Murana G, Castelli A, Alfonsi J, Di Bartolomeo R, et al. Acute type A aortic dissection: rationale and outcomes of extensive repair of the arch and distal aorta. *Int J Cardiol*. 2018;267:145-9.
2. Di Bartolomeo R, Murana G, Di Marco L, Pantaleo A, Alfonsi J, Leone A, et al. Frozen versus conventional elephant trunk technique: application in clinical practice. *Eur J Cardiothorac Surg*. 2017;51(suppl 1):i20-8.
3. Liu J, Shi Y, Guo H, Yu C, Qian X, Sun X, et al. Aortic balloon occlusion technique versus moderate hypothermic circulatory arrest with antegrade cerebral perfusion in total arch replacement and frozen elephant trunk for acute type A aortic dissection. *J Thorac Cardiovasc Surg*. 2021;161:25-33.
4. Kim DH, Chang SW, Matsumoto J. The utilization of resuscitative endovascular balloon occlusion of the aorta: preparation, technique, and the implementation of a novel approach to stabilizing hemorrhage. *J Thorac Dis*. 2018;10:5550-9.
5. Morrison JJ, Galgon RE, Jansen JO, Cannon JW, Rasmussen TE, Eliason JL. A systematic review of the use of resuscitative endovascular balloon occlusion of the aorta in the management of hemorrhagic shock. *J Trauma Acute Care Surg*. 2016;80:324-34.
6. Chaucer G. *The Knight's Tale*. Cambridge: Cambridge University Press; 2016.