

access. In the study, there were 14 (41.2%) patients who required ongoing CPR at the beginning of surgery; however, only 4 of them received preoperative extracorporeal membrane oxygenation support. This seems to leave further room for research on the role of preoperative extracorporeal CPR in these patients.

Due to small number of patients analyzed in the statistical model, there are several limitations to draw a rigorous conclusion from this study. Nevertheless, there is no doubt that the present study by Uehara and colleagues offers valuable information to understand the role of surgery in this devastating condition. Further study with a larger sample size from multiple centers may suggest stronger guidance to determine optimal treatment strategy.

See Article page 1173.



Commentary: The outer limits

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“Primum nil nocere.” If cardiac surgeons lived purely by the dictum of “first do no harm,” our discipline would not exist. All maneuvers performed by cardiac surgeons carry inherent risk due to the invasive nature of the profession. Ethically, we reconcile this using the concept of the risk/benefit ratio; interventions are justified when the calculated balance is acceptable to both the surgeon and patient. This requires the grave responsibility of the physician to “tell the antecedents, know the present, and foretell the future” (Hippocrates, “Of the Epidemics”).¹ In the modern era, we have the benefit of shared evidence to help inform these responsibilities.

As to these calculations, acute type A aortic dissections are a unique situation. The wide gap between the acute dismal natural history of the disease and the survival



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CENTRAL MESSAGE

Survival of acute type A aortic dissection patients requiring CPR prior to surgical repair is extremely low.

References

1. Centofanti P, Flocco R, Ceresa F, Attisani M, La Torre M, Weltert L, et al. Is surgery always mandatory for type A aortic dissection? *Ann Thorac Surg.* 2006;82:1658-63; discussion 1664.
2. Conzelmann LO, Weigang E, Mehlhorn U, Abugameh A, Hoffmann I, Blettner M, et al. Mortality in patients with acute aortic dissection type A: analysis of pre- and intraoperative risk factors from the German Registry for Acute Aortic Dissection Type A (GERAADA). *Eur J Cardiothorac Surg.* 2016;49:e44-52.
3. Evangelista A, Isselbacher EM, Bossone E, Gleason TG, Eusanio MD, Sechtem U, et al. Insights from the international registry of acute aortic dissection: a 20-year experience of collaborative clinical research. *Circulation.* 2018;137:1846-60.
4. Goda M, Imoto K, Suzuki S, Uchida K, Yanagi H, Yasuda S, et al. Risk analysis for hospital mortality in patients with acute type A aortic dissection. *Ann Thorac Surg.* 2010;90:1246-50.
5. Uehara K, Matsuda H, Matsuo J, Inoue Y, Shijo T, Omura A, et al. Surgical outcomes of acute type A aortic dissection in patients undergoing cardiopulmonary resuscitation. *J Thorac Cardiovasc Surg.* 2021;161:1173-80.
6. Pan E, Wallinder A, Peterstrom E, Geirsson A, Olsson C, Ahlsson A, et al. Outcome after type A aortic dissection repair in patients with preoperative cardiac arrest. *Resuscitation.* 2019;144:1-5.

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potential with surgical intervention makes rapid decision-making and deployment of resources generally straightforward. For a majority of cases, the surgeon can feel assured that benefit can be offered, and that the benefit is of major worth, namely prevention of death. Neurologic outcome and avoidance of comorbidity are less assured, but these are outweighed by the value of life. In this issue of the *Journal*, Uehara and colleagues² explore the most difficult, challenging subgroup of patients with acute type A aortic dissections—those who present with recent

or ongoing cardiopulmonary resuscitation (CPR). The approach and methods described in their paper represent truly “heroic efforts,” not only by the surgeons but the team and hospital system as well. Mean hospital arrival-to-operating room was 22 to 25 minutes, patients with ongoing CPR on arrival to the operating room underwent pericardiectomy, and there was liberal use of total arch replacement in those who could be stabilized after CPR or pericardiectomy. These aggressive efforts were under the described hospital policy of performing surgery “even in patients with extremely low probability of survival.” On multivariable analysis, CPR duration >15 minutes was the only significant risk factor for in-hospital mortality, and the authors’ central message is a proposal to refine this approach by reconsidering surgery in these patients.

From their data, it should be more explicitly stated that CPR >15 minutes was not merely a “risk factor”; in fact, survival with a meaningful neurologic outcome was nil in this group. Other lessons learned are that the likelihood of return of spontaneous circulation (ROSC) with CPR is low (50%), ROSC after pericardiectomy with ongoing CPR is low (50%), and survival if ROSC is not achieved after pericardiectomy is also nil. Further, the role of preoperative extracorporeal membrane oxygenation is brought into question, with only 1 of 4 patients achieving ROSC and surviving. Acidosis and lactate levels did not appear useful in predicting survival, in distinction to other papers examining broader cohorts. Again, these results should be interpreted in the context of a high-volume aortic center with the requisite resources, infrastructure, and expertise to rapidly treat these patients. Further, patients who underwent CPR and did not survive hospital transport were excluded from the denominator. Finally,

other investigations of extreme-risk cohorts have identified changes in practice that might modulate risk; for example, Lawton and colleagues³ identified the combination of abdominal malperfusion and severe acidosis as uniformly fatal, and malperfusion correction before surgical repair is being studied as a potential alternative algorithm.⁴ In the case of cardiovascular collapse, extracorporeal membrane oxygenation either pre- or post-operatively seems to be of extremely limited ability to modulate risk; the ability to affect ROSC appears to have not only systematic but physiologic limits.

As the authors point out, it is challenging to interrupt the heroic efforts and resources invested along the prehospital chain of events once initiated. Yet, it is the surgeons’ ultimate responsibility to “foretell the future” to the best of their abilities and to judge whether continued efforts are justified, judicious interventions or ultimately futile. The rare cases of survivors, and our surgical nature, may bias us toward continuing heroic efforts. The work and experience of Uehara and colleagues provide us some objective data by which to assess those biases.

References

1. Hippocrates. *Of the Epidemics* (Francis Adams, Transl). Whitefish, MT: Kessinger Publishing; 2010.
2. Uehara K, Matsuda H, Matsuo J, Inoue Y, Shijo T, Omura A, et al. Surgical outcomes of acute type A aortic dissection in patients undergoing cardiopulmonary resuscitation. *J Thorac Cardiovasc Surg*. 2021;161:1173-80.
3. Lawton JS, Moon MR, Liu J, Koerner DJ, Kulshrestha K, Damiano RJ, et al. The profound impact of combined severe acidosis and malperfusion on operative mortality in the surgical treatment of type A aortic dissection. *J Thorac Cardiovasc Surg*. 2018;155:897-904.
4. Leshnower B, Keeling WB, Duwayri Y, Jordan WD, Chen EP. The “thoracic endovascular aortic repair-first” strategy for acute type A dissection with mesenteric malperfusion: initial results compared to conventional algorithms. *J Thorac Cardiovasc Surg*. 2019;158:1516-24.