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EDITORIAL COMMENT

Aortic Dissection Registries

The Tools to Keep Us in Check*

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Acute type A aortic dissections (ATAADs) represent aortic catastrophes and life-threatening surgical emergencies, as stated by Zhao et al[1] in their first multicenter registry for ATAADs in China published in this issue of *JACC: Asia*. Traditionally, in the 1990s and early 2000s, the reported surgical mortality with ATAADs was as high as 26%, and mortality with medical management was as high as 60% at 30 days, or a 1% to 2% per hour early mortality rate in medically managed patients.[2,3]

Significant strides have been made to improve patient outcomes, with the Society of Thoracic Surgeons reporting a mortality of 17%, similar to that of the German National Registry.[4,5] Interestingly, individual aortic centers of excellence have been reporting better outcomes, with surgical mortalities ranging between 2.8% and 9%.[6-9] This outcome discrepancy tells us that we can do better.

Notable strides have also been made in the medical management of patients with ATAAD. Recently published International Registry for Acute Aortic Dissection data from 1996 to 2018 showed significantly lower mortality in the medically managed population (ie, ~0.5% per hour).[10] The formation of a specialized team, protocols triggering fast diagnostic confirmation, and rapid patient transport, including air transport, to minimize the time from onset of symptoms to the operating room are the keys to success.[9] The challenge in this approach of maximizing utilization of aortic centers of excellence is in the ability to exercise proper clinical judgment when selecting patients who are candidates for transfer vs those requiring immediate intervention. The patient might be unstable, and transfer may be hazardous. For example, patients with hemorrhagic pericardial effusions and cardiac tamponade. Such patients need immediate life-saving surgical intervention to relieve tamponade. Additional surgery can be limited to ascending or hemiarch replacement even in a patient with dilated root or arch if the surgeon is inexperienced with more extensive procedures. In such situations, immediate, less comprehensive surgical intervention would be appropriate and hopefully sufficient to get the patient through the critical period. Such patients could then be referred and followed up in a large-volume center where remaining pathologies could be addressed in a staged manner.

Continuously evolving surgical technique and management have contributed to improved ATAAD-related mortality as well. A recently published American Association for Thoracic Surgery expert consensus document encompassed valuable lessons learned thus far.[3] Because femoral cannulation has been associated with an increased risk of stroke, axillary and direct aortic cannulation have been used more often in recent times.[11,12] Use of axillary cannulation has been associated with improved outcomes and reduced risk of stroke, as we found in our experience; however, direct cannulation was also associated with lower stroke risk and at the same time faster establishment of cardiopulmonary bypass and true lumen flow, which we find extremely important in patients in hyperacute presentations with end-organ malperfusion.[11-14]

Circulatory arrest has become safer, with selective cerebral perfusion enabling longer circulatory arrest times. De-airing of the arch is one of the critical steps in arch surgery; some surgeons use retrograde cerebral perfusion in conjunction with antegrade perfusion if done with direct vessel cannulation just

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to de-air and flush out the head before coming off circulatory arrest. More efficient surgical techniques to address the arch have been developed, and are still evolving, including the use of stents for frozen elephant trunk and its fenestrated modifications for the arch, because time matters.

At the Cleveland Clinic, we found that the use of a modified fenestrated elephant trunk, developed by Roselli et al,[15] is a very efficient, reproducible, and safe way to address the arch in this critical patient population. The technique is currently approaching the final phases of its clinical trial, B-SAFER (Branched Stented Anastomosis Frozen Elephant Trunk Repair; NCT04747626). Thus, the arch paradigm in these patients is moving toward safety and simplification by needing only hemiarch anastomosis and at the same time having the whole arch completely addressed. A commonly feared situation among surgeons who do not have extensive aortic experience is what to do with the arch if it has a tear or if it is dilated. These modified techniques might be the answer to this dilemma. Perhaps we could get to a point where "with enough simplification, anyone can do it."

Postoperative management is also something that must not be ignored. Large centers have intensive care unit teams that are more experienced with ATAADs and any other associated comorbidities. These patients are not elective, and almost always we learn about their "other" problems only later after surgery. An additional important point is blood pressure management because many of these patients have severe hypertension. Their organs, and most importantly the brain, are used to higher perfusion pressures. A delicate balance has to be struck to avoid potentially harmful hypotension but at the same time treat hypertension that can increase the risk to their remaining dissected thoracoabdominal aorta.

Registries are helpful to keep us in check, follow the progress in the field, and determine further steps for improvement. Zhao et al[1] should therefore be congratulated for their work on the first Chinese registry and open reporting of data on ATAADs. This registry receives data from 10 experienced centers, which is reflected by good outcomes and type of surgery performed. Of the 93.5% of patients who needed arch intervention, 4.8%, 88.7%, and 75.6% underwent hemiarch, total arch, and frozen elephant trunk procedures, respectively. This aggressive approach reflects the practice of skilled high-volume aortic surgeons. However, the authors noted that the median time from symptom onset to hospital arrival was 10.6 hours, and from the emergency department to operating room was 13 hours, which are significantly higher than International Registry of Acute Aortic Dissection data and certainly an area for improvement.[10] These times are clearly excessive, particularly in patients with a hyperacute presentation in whom any delays to definitive surgery are poorly tolerated.

Another interesting point is that the median patient age was 51 years,[1] which is significantly younger compared with other registries. The reasons for this difference are unclear. Do ATAADs affect a younger population in China, or is the reported younger age a manifestation of selection bias? Younger and perhaps healthier patients are more likely to survive and get to be transferred to treating centers. This should be an area of further research and scrutiny.

In conclusion, Zhao et al[1] have admirably used data from a multicenter registry to share with us state-of-the-art surgical outcomes of ATAADs at centers in China. The bar is high, but further work is needed to add more centers to the registry to achieve additional global countrywide representation. The current study identifies important gaps in access and timeliness of care in ATAADs that present opportunities for future improvements.

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