Editorial Comment

Setting the bar for complex aortic arch disease: implications for therapeutic options

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In this issue, Urbanski et al. [1] have reviewed their experience with 131 consecutive patients undergoing conventional aortic arch replacement surgery over an 8-year period. The average patient age was 66 years, and the usual comorbidities (including stroke in 7% and previous cardiac surgery in 13%) were present. Patients requiring intervention for acute aortic dissection were excluded, as were those undergoing simple open anastomosis (i.e. hemiarch) aortic replacement. The vast majority of patients (>90%) underwent concomitant procedures, with approximately one-quarter undergoing aortic root replacement and one-quarter coronary bypass surgery.

The authors achieved outstanding results in this relatively high-risk patient cohort with a perioperative stroke rate of 0.8%, a temporary neurological deficit rate of 4.6% and a 30-day mortality rate of 2.3%. Five-year survival was 82%, with 3 cases of downstream aortic-related death. The authors attribute at least part of their remarkable results to their strategy of avoiding deep hypothermia. Patients were operated on with a mean minimum body (rectal) temperature of 30°C, and yet displayed very low neurological complication rates and no cases of paraplegia. It should be stressed, however, that the authors achieved complete arch replacement surgery with an impressively short mean circulatory arrest time of 36 min. Deep hypothermia should not be completely abandoned as a neuroprotective tool, particularly when the surgeon anticipates a prolonged circulatory arrest time.

Another possible explanation for the authors’ tremendous results is that antegrade cerebral perfusion (ACP) was used in all patients, making another strong argument for its routine use in aortic arch surgery. These investigators used unilateral ACP in nearly all patients, but several experts still advocate bilateral ACP. A prospective, randomized trial (Prevention of Ischaemic Neurological Deficit in Aortic Arch Surgery, PINeDAS) has been initiated by the Vascular Domain of the European Association for Cardiothoracic Surgery and will hopefully shed more light on this issue in the years to come. The relatively high volume of total arch replacement surgery in the authors’ centre of excellence may also have contributed to their outstanding results. Examples of associations between hospital/clinician volumes and improved outcomes exist for several different cardiac surgical procedures, and the important team management required for aortic arch surgery makes it very likely that such an association

Dr Y. Okita (Kobe, Japan): I have to raise a question about the temperature. You perfuse the patients at 28 degrees. I noted that one patient had massive gastrointestinal tract necrosis. We had a similar patient, a 75-year-old woman with a massive gastrointestinal tract necrosis. Her rectal temperature was 31, but the brain temperature was, if I remember, 27 or 26. So, especially in patients with a very, very atherosclerotic gastrointestinal tract artery, very calcified, I think moderate hypothermia is very dangerous for protecting the gastrointestinal tract.

Dr Urbanski: Yes, it can be dangerous if the diagnostics are not properly done. In the case you referred to, I showed the slide with the CT angiography of the case as a note of caution. We did not find the problem with the upper mesenteric artery until autopsy, but we should take these changes into consideration before surgery. Currently, if we were to see atherosclerotic calcifications at abdominal level on CT angiography, we would perform abdominal angiography to look at the visceral vessels. And in such patients we would now consider revascularization of the mesenteric artery prior to elective surgery of the thoracic aorta.

Dr Okita: Would you go to deeper hypothermia?

Dr Urbanski: I’m not sure if the deep hypothermia would be the only solution to resolve this problem. I think the problem should be resolved by proper diagnostics and proper therapy.
holds true for these procedures. Finally, it needs to be mentioned that over 95% of patients in this study were operated on by one surgeon (P. Urbanski, personal communication). Whether or not these outstanding results can be replicated by others in the general cardiovascular surgery community is open to debate. One can conclude, however, that this publication has set a new standard for the management of patients with complex aortic arch disease.

Setting the bar for outcomes in aortic arch patients is increasingly relevant in the current era of expanding endovascular aortic procedures. Patients with complex aortic arch pathology are being treated ever-more frequently with hybrid procedures consisting of some form of surgical aortic arch debranching, followed by endovascular aortic repair. However, the complication rates for hybrid debranching procedures are undoubtedly higher than those found by Urbanski et al. A multicentre study of patients undergoing hybrid debranching with placement of the proximal stent in the ascending aorta \((n = 66)\) found an in-hospital mortality rate of 9%, a stroke rate of 5% and a paraplegia rate of 3% [2]. Similarly, a systematic review of aortic arch hybrid debranching procedures \((n = 642)\) revealed mortality, stroke and paraplegia rates of 11.9, 7.3 and 4.3%, respectively [3].

Much of the observed complication rates for hybrid debranching can be explained by the fact that these procedures are usually performed in very high-risk patients. Although a hybrid approach may result in a lower risk than conventional surgery in very high-risk or inoperable patients, one must not forget that such patients usually have asymptomatic aortic disease, and that they frequently have a limited lifespan with or without treatment of their aortic pathology, because of significant comorbidities [4].

In the astute words of Craig Miller, it is often difficult to define ‘the hazy line between utility and futility’ in such high-risk aortic patients [5]. Determining who is suitable for hybrid procedures is even more complicated by the fact that there is no general consensus within the cardiovascular community as to what constitutes high-risk or inoperable status for patients with aortic disease. We are urgently in need of such an initiative.

There has been a rapid growth in endovascular stenting of the thoracic aorta over the last decade [6], with a similar increase in hybrid debranching procedures of the aortic arch and a corresponding surge in hybrid debranching publications [3]. The rapid growth in hybrid debranching procedures would suggest that ‘indication creep’ from very high-risk/inoperable to lower-risk aortic arch patients is occurring. However, further expansion of hybrid aortic arch procedures into lower-risk patients should be avoided for at least three reasons. First, it is already known that endovascular aortic repair offers steadily decreasing benefits over conventional aortic surgery over time [7]. Secondly, lower-risk patients would have a higher lifetime risk of developing the follow-up complications of endovascular therapy, i.e. endoleak, aortic dissection, oesophageal perforation, infection. These complications occur at a much higher rate than after conventional aortic replacement surgery and are particularly troublesome given the challenging clinical scenario posed by open aortic surgery postendovascular therapy [8]. Finally, the results of Urbanski and other aortic centres of excellence [1, 9, 10] would suggest that the bar has been set too high for endovascular therapy in non-high-risk/inoperable patients.

Choosing which therapeutic option is appropriate for which aortic arch patient is a complex process and should probably be performed by a team of cardiovascular specialists, analogous to the Heart Team for transcatheter aortic valve and coronary bypass procedures. Such an ‘Aortic Team’ would consist of cardiac surgeons, vascular surgeons, cardiologists and radiologists. Given the relative rarity of aortic arch disease, such teams should probably be limited to high-volume centres. Indeed, the results of Urbanski et al. would argue that referring physicians may be morally obliged to refer patients with complex aortic arch disease to aortic centres of excellence.

In conclusion, Urbanski et al. are to be congratulated on achieving outstanding results in a relatively high-risk group of patients with complex aortic arch disease. A new bar has been set for these patients, one which should be taken into account when considering non-conventional therapies and referral patterns for aortic arch disease.

REFERENCES