Surgery in Type I Aortic Dissection: Is Simple the Best?

Sir,

The authors read the article entitled "*Application of Bilateral Cerebral Perfusion + Balloon Occlusion of Descending Aorta + Antegrade Perfusion of Lower Body in DeBakey Type I Aortic Dissection*" by Yujian *et al*.[1] with great interest. While the study was a small series of 32 patients, the mortality rate of 3.13% was an excellent result, and the authors commend their innovative approach.

While the authors agree with many aspects of the described technique in the article, the authors also have several reservations. In Type-I aortic dissection, the authors believe that more aggressive surgical approaches, such as conventional elephant trunk, frozen elephant trunk, or Sun's techniques, should be performed, particularly in experienced centres and for younger patients, to reduce both early and late complications. According to the American Society of Thoracic Surgeons (STS) data, there is no significant mortality difference between surgery involving only ascending aorta replacement *versus* arch replacement (18.9% *vs.* 19.8%).[2]

The authors reported no cases of paraplegia, intestinal necrosis, or extremity ischaemia in their series. In their own series of about 100 unpublished cases, the authors also did not encounter these complications, despite performing open distal aortic anastomosis without distal perfusion under antegrade cerebral perfusion (ACP) and total circulatory arrest (TCA). In TCA with mild hypothermia, the primary concern is organ protection. The safe time limit for TCA with mild hypothermia to protect the spinal cord has not been well-established. Asai *et al*.[3] reported no paraplegia in 105 cases with one-hour TCA at 25-28°C, with only 2% requiring dialysis. In a meta-analysis by Angeloni *et al*.[4] bilateral ACP was used in 3,206 of 5,100 cases, with an average TCA and ACP times of 30 minutes at 23-24°C. No differences in mortality or neurological outcomes were observed between unilateral and bilateral ACP groups. As Plato (in 400 BC) and Aristotle (in 350 BC) said, "nothing in excess," and Shakespeare (in 1606) remarked, "Best is the enemy of good". Hence, "Is simple the best approach?"

Additionally, distal perfusion using balloon occlusion of the proximal thoracic aorta, as described in this study, has been previously defined using axillary and femoral cannulation. In Nappi's article 16 years ago, they reported balloon occlusion for distal aortic perfusion as a technique they had already described.[5]

Finally, for Type-I aortic dissection, total arch surgery is performed *via* standard median sternotomy. However, the article mentions thoracotomy incision for aortic surgical access. This seems unusual—could this be a typographical error in the manuscript?

COMPETING INTEREST:
The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
AM, DC: Conception, design of the work, acquisition, analysis, and interpretation of data for the work.
Both authors approved the final version of the manuscript to be published.

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Received: January 13, 2025; Revised: January 16, 2025; Accepted: January 18, 2025
DOI: https://doi.org/10.29271/jcpsp.2025.04.550

AUTHOR'S REPLY:

Sir,

Thank you very much for your letter. The authors have previously noted Nappi's article,[1] and his contributions in the area of aortic dissection have greatly inspired us. We have carefully reviewed Nappi *et al*.'s literature[2] and chose to report our team's approach based on the following points:

Position of balloon device insertion: In the present surgery, the authors directly insert the balloon device into the descending aortic stent, with the proximal infusion tube exiting from the fourth branch of the graft vessel and connecting to the second infusion tube for lower body perfusion (Figure 1A). In contrast, Nappi inserts the balloon from the proximal main conduit of the graft vessel into the descending aortic stent (Figure 1B). Additionally, the literature indicates that the use of aortic balloon occlusion (ABO) technology can reduce circulatory arrest (CA) time and improve recovery after frozen elephant trunk (FET) surgery and total aortic arch replacement (TAR). This technique represents a practical strategy for treating high-risk surgical patients, as it has a lower complication rate compared to traditional methods.[3] However, the author placed the balloon within the stent elephant trunk from the proximal descending aorta while perfusing the lower body organs from the femoral artery. In another study, the author demonstrated. The ABO technique significantly shortened the circulatory arrest time and safely elevated temperature, and provided better renal protection in patients undergoing TAR with FET. The ABO technique did not reverse the need for continuous renal replacement therapy (CRRT) nor did it reduce mortality or major adverse events.[4]

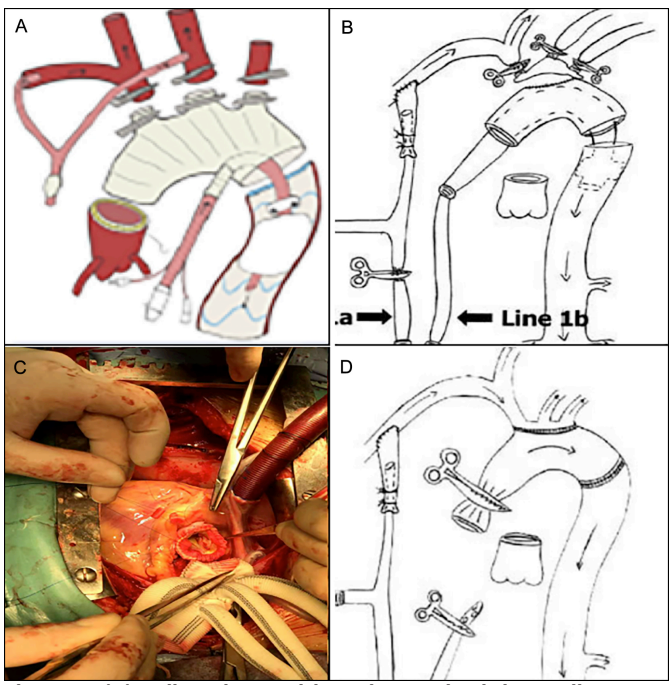

Figure 1: (A) Balloon inserted into the proximal descending aorta through the fourth branch graft vessel (B) Balloon inserted into the proximal descending aorta through the proximal graft vessel (C) Graft vessels (D) Island anastomosis.

Graft vessels: The vascular graft used by Nappi may differ from the one that authors currently use, as the article did not provide corresponding images of the graft vessel, while authors utilise a four-branch graft vessel (Figure 1C).

Aortic arch resection and branch anastomosis: There are differences between Nappi's approach to aortic arch resection and preservation compared to the present surgical method. This completely resects the aortic arch and sequentially anastomose the brachiocephalic trunk, left common carotid artery, and left subclavian artery to the graft vessel shown in Figure 1C. In contrast, Nappi employs an "island anastomosis" preserving a portion of the aortic arch's upper vascular segment (including the three branches), and then anastomosing the entire "island segment" to the graft vessel (Figure 1D). The reconstruction methods of the aortic arch and the time of anastomosis differ, which may lead to different clinical outcomes.

Cerebral perfusion: The literature and data from the expert's centre provided to us indicate that there is no significant difference in mortality or neurological outcomes between the bilateral and unilateral antegrade cerebral perfusion (bACP/uACP) groups. A previous literature report on eight retrospective cohort studies, which included 2,416 patients (uACP: 843, BACP: 1573), showed similar results in inpatient mortality, postoperative neurological deficits (PNDs), transient neurological deficits (TNDs), renal failure, and re-exploration bleeding rates between uACP and bACP in patients with acute type A aortic dissection (ATAAD). The bACP group had a shorter intensive care unit (ICU) stay, while the uACP group had a shorter length of hospital stay.[5] Moreover, the risk of brain injury following surgery for type A aortic dissection (TAAD) remains substantial, and no consensus has still been reached on which neuroprotective technique should be preferred.[5] A study from the UK National Adult Cardiac Surgical Audit included 1,929 patients undergoing surgery for TAAD (2011-2018). Deep hypothermic circulatory arrest (DHCA) only, uACP, bACP, and retrograde cerebral perfusion were used in 830, 117, 760, and 222 patients, respectively. The conclusion showed: "In TAAD repair, the use of uACP and bACP was associated with a lower adjusted risk of death and/or cerebrovascular accident (CVA) compared to DHCA". Additionally, uACP can offer some advantages, but only for shorter CA durations.[6] Another paper reported that uACP can provide valuable technical simplicity for cardiac surgeons, while bACP can be utilised for circulatory arrest times exceeding 30 minutes.[7] Therefore, the present team recently reported the application of bACP + ABO technology in acute DeBakey Type I aortic dissection surgery. Although the innovation is limited, this report is based on real data from the present centre.

Thoracotomy: This term primarily refers to an incision made on the side of the chest, applicable to procedures involving lung surgery, the resection of intrathoracic tumours, pleural diseases, and pneumothorax. In contrast, median sternotomy involves a vertical incision along the middle of the sternum, primarily used for cardiac surgeries and certain major vascular procedures. The use of this term was not a typographical error; rather, the authors believe the confusion arose during the translation process from Chinese to English, where the concepts were mixed up.

Status of aortic dissection surgery: Professor Nappi is an internationally renowned cardiac surgeon with extensive surgical experience, and his team is equally experienced. The centre has only been performing aortic dissection surgeries for 10 years and is

still in a phase of continuous learning and growth. Initially, the present surgical team was in a period of adjustment, leading to a higher incidence of complications, particularly neurological and abdominal organ complications, which reached 15% for neurological complications and 10% for renal failure complications, significantly exceeding international standards. This negative impact on the expectations of patients who trust the present centre has motivated us to adopt this method for performing aortic dissection surgeries.

The authors are very grateful to this reviewing expert for sharing their centre's valuable experience, and the authors would like to express their respect to you and your team. A few years ago, the present centre also adopted uACP combined with lower body circulatory arrest technology. As mentioned in point 4, the authors faced numerous complications and mortality rates, leading to several medical disputes. The authors analysed that the primary reason was still that their team was in a developing stage, with relatively low surgical experience, team coordination, and intensive care capabilities. It is well-known that the growth of aortic surgeons and their teams requires a relatively long process, and deficiencies in any aspect can severely impact patient clinical outcomes. Over the past few years, the authors have arranged for senior physicians from the present team to learn and exchange experiences at major cardiac centres such as the Mayo Clinic in the USA, the Berlin Heart Centre in Germany, and Fuwai Hospital in Beijing. Through continuous improvements, learning, and reflection over the past three years, the overall mortality rate within 30 days post-aortic dissection surgery has significantly decreased.

Others: In aortic dissection surgeries, particularly total aortic arch replacement surgeries, factors such as the extent of vascular rupture, and the experience of the surgical team (including the surgeon, anaesthesia management, extracorporeal circulation management, and postoperative intensive care) all influence postoperative complications.

Expert commentary: As a member of the team, the feedback provided by the reviewing expert is very positive and constructive. The authors will earnestly adhere to the principle that "the best is the enemy of the good," choosing the most suitable surgical techniques from the present technical and experiential standpoint to save patients. As noted by Preventza *et al*. in their article: "In this intrinsically complex disease, survival is the most important outcome".[7] In future clinical research, the authors will continue to address the present shortcomings based on the feedback from experts and suggestions from readers. The authors aim to further enhance the innovation of the present studies by including more variables, such as establishing control groups, distal aortic remodelling, and long-term follow-up, to further explore the long-term effects of this method.

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