The Egyptian Cardiothoracic Surgeon

In Press

Original Article

# Comparison Between the Impact of Antegrade Versus Retrograde Arterial Cannulation Techniques on the Early Outcome of Patients with Type A Aortic Dissection

**Ahmed Ahmed[1], Ashraf Elsebaie[1], Tamer Siam[2], Hosam Abdel Hamid[1], Mohamed Essa[1]**

[1] Department of Cardiothoracic Surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt

[2] Department of Cardiothoracic Surgery, Faculty of Medicine, Misr University for Science and Technology, Cairo, Egypt

In Press

## Abstract

**Background:** Acute type A aortic dissection represents one of the most critical emergencies in cardiovascular surgery, demanding rapid diagnosis and prompt operative intervention. Despite significant advances in surgical strategies and perioperative management, morbidity and mortality remain high, and the choice of cannulation technique continues to generate debate among surgeons worldwide.

**Methods:** It is a prospective non randomized comparative study aimed to compare the early outcome of repair of type A aortic dissection using different cannulation techniques by sorting them into two groups, Group 1, The antegrade group (30 patients) in which axillary, innominate and central cannulation was done and Group 2, the retrograde group (30 patients) in which femoral cannulation was done from March 2021 till September 2025.

**Results:** The mean age was 56.2 ± 11.4 for group 1 and 58.6 ± 10.7 for group 2. The in-hospital mortality was 2 patients (6.7%) in the antegrade group versus 5 patients (16.7%) in the retrograde group while the 30-day mortality was 3 patients (10%) in the antegrade group versus 6 patients (20%) in the retrograde group.

**Conclusion:** Antegrade and retrograde cannulation both remain safe and effective strategies in managing acute type A aortic dissection. Antegrade approaches showed meaningful advantages in procedural efficiency, cerebral protection, and recovery outcomes. When pathology and surgical expertise permit, antegrade cannulation should be favored. while retrograde access remains a reliable option in emergency cases.

KEYWORDS
Aortic dissection; Arterial cannulation; Antegrade Cannulation; Retrograde cannulation

## Introduction

Type A Aortic dissection is a fatal disease with high morbidity and mortality requiring emergent and urgent intervention. Without operation, the outcome is much worse. The use of cardiopulmonary bypass with hypothermic circulatory arrest is the optimum option [1, 2].

**Corresponding author:** Ahmed Ahmed afouad38@yahoo.com

© The Author(s) 2025. Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/.

Replacement of the ascending aorta together with resection of the entry site with an open distal ascending, hemiarch or total arch replacement (depending on the intimal tears) is the preferred strategy. In case of open distal anastomosis, an interval of hypothermic circulatory arrest usually with the neuroprotective option like selective cerebral perfusion is required [3].

The survival of cases is dependent on an optimum operative strategy, but the factors affecting mortality are still uncertain. The cannulation techniques might influence the outcome of the cases.

Central cannulation in the ascending aorta has the advantage of antegrade perfusion, but still has the risk of cannulating the false lumen. This may lead to progression of the dissection, malperfusion syndrome or aortic rupture. So, cannulation of the axillary artery either directly or with an end-to-side graft is an alternative and adequate option in aortic dissection patients. Conversely, femoral artery cannulation is the fastest and easiest option, but may lead to retrograde flow in the aorta and may lead to plaque rupture and cerebral embolization. Additionally, malperfusion may occur with retrograde flow [4].

The aim of this study is to compare the impact of antegrade (axillary, aortic, innominate) cannulation with retrograde (femoral) cannulation on the early outcome of surgery for patients with Stanford type A aortic dissection.

## Patients and Methods

It is a prospective non-randomized comparative study between two groups, Group 1, antegrade group in which axillary, innominate and central cannulation was done, no carotid or transapical cannulation was done in the antegrade group in our study. And Group 2, the retrograde group in which femoral cannulation was done. The study was conducted at Cardiothoracic Surgery department, Ain Shams University, Egypt during the period from March 2021 till September 2025. The approval of the local ethical committee was obtained under the number FAMSU MD 267 / 2022 and an informed consent from each patient was obtained. The study included 60 patients: 30 patients in the antegrade Group and 30 patients in the retrograde Group. All consecutive patients during the study period were included. Group 1 (antegrade group): 30 patients repaired aortic dissection by means of antegrade cannulation. Group 2 (retrograde group): 30 patients repaired aortic dissection by means of retrograde cannulation. The allocation for both groups was based on pathology (e.g., extent of dissection) and surgeon preference. The primary outcomes were mortality and neurological complications while the secondary outcomes were the time consumed in each cannulation technique and the cannulation related complications, postoperative renal and liver impairment, ICU stay and hospital stay. A detailed history was taken like age, sex, presence of risk factors for dissection, presence of preoperative malperfusion, onset and duration of chest pain. Blood pressure, pulse, respiratory rate, presence of shock, cardiac tamponade, distal limb malperfusion were documented. A full neurological examination was performed. Routine labs were ordered. Echocardiography to confirm the presence of dissection flap, aortic regurge, aortic root dimensions, pericardial collection, EF and RWMA. CT chest aortography was done for all patients to confirm the diagnosis and give information about extension of dissection and presence of pericardial & pleural leakage. Magnetic resonance angiography was used for patients with renal impairment. Intraoperative TEE was routinely used. Cardio-pulmonary bypass time, total cross-clamp time, and cardioplegia mode were recorded. Circulatory arrest data like duration and the use of antegrade or retrograde cerebral perfusion were obtained. All patients were evaluated thoroughly during their ICU and hospital stay for the weaning of mechanical ventilation, post operative bleeding, blood transfusion requirement, stroke and mortality. Demographic data are mentioned in Table 1.

## Statistical analysis

Results are expressed as mean ± standard deviation or number (%). Comparison between categorical data [n (%)] was performed using Chi square test, While Fisher's Exact test was used for variables where expected cell counts are <5.. The Kolmogorov-Smirnov test was used to measure the distribution of data. Accordingly, comparison

In Press

*Table 1: Demographic Data*

| Parameter | Antegrade Group (n=30) | Retrograde Group (n=30) | p-value |
|---|---|---|---|
| Age (years, mean ± SD) | 56.2 ± 11.4 | 58.6 ± 10.7 | 0.421 |
| Male gender (%) | 21 (70%) | 22 (73.3%) | 0.774 |
| Body Mass Index (kg/m²) | 27.5 ± 3.2 | 28.0 ± 3.5 | 0.541 |
| Hypertension (%) | 25 (83.3%) | 24 (80%) | 0.739 |
| Diabetes Mellitus (%) | 6 (20%) | 5 (16.7%) | 0.739 |
| Smoking (%) | 18 (60%) | 17 (56.7%) | 0.793 |

between variables in the two groups was performed using either unpaired t test or Mann Whitney test whenever it was appropriate. Statistical Package for Social Sciences (SPSS) computer program (version 19 windows) was used for data analysis. P value ≤ 0.05 was considered significant. Sample size calculation was performed by the staff from the community and statistics department where a sample size of 30 cases in group 1 and 30 cases in group 2 achieve 81% power to detect a non-inferiority difference between the 2 groups.

## Results

Preoperative characteristics of the included patients are shown in Table 2. Regarding the operative details, cardiopulmonary bypass time was 198 ± 38 minutes for the antegrade group versus 211 ± 42 minutes for the retrograde group (p-value 0.131) while cross clamp time was 132 ± 26 minutes for the antegrade group versus 139 ± 30 minutes for the retrograde group (p-value 0.247). The hypothermic circulatory arrest and cerebral perfusion techniques of both groups are summarized in Table 3

The type of surgery performed in both groups are shown in Table 4. The site of arterial cannulation is mentioned in Table 5.

The post operative outcomes have been mentioned in Table 6. Summary of the neurological outcome have been shown in Table 7.

The in-hospital mortality was 2 patients (6.7%) in the antegrade group versus 5 patients (16.7%) in the retrograde group while the 30-day mortality was 3 patients (10%) in the antegrade group versus 6 patients (20%) in the retrograde group. Post operative mortality is shown in Table 8. There were no cannulation-related complications in both groups.

## Discussion

Regarding the baseline demographic data of the included cases, we observed that both groups had balanced and equally distributed demographics that were overall highly representative of typical type A dissection cohorts in real life. The lack of significant differences in the baseline variables also help in reducing the risk of confounding bias in our results.

In our study, the included patients had a mean age of 57.4 years, which is consistent with previous data published in the literature that reported a mean age between 55–65 years for type A dissection [5, 6].

In Press

*Table 2: Preoperative Characteristics*

| Parameter | Antegrade (n=30) | Retrograde (n=30) | p-value |
|---|---|---|---|
| DeBakey Type I (%) | 24 (80%) | 23 (76.7%) | 0.755 |
| Aortic regurgitation ≥ grade II (%) | 10 (33.3%) | 12 (40%) | 0.592 |
| Malperfusion syndrome (%) | 5 (16.7%) | 7 (23.3%) | 0.507 |
| Acute dissection (<14 days) (%) | 26 (86.7%) | 25 (83.3%) | 0.739 |
| Chronic dissection (%) | 4 (13.3%) | 5 (16.7%) | 0.739 |

*Table 3: Operative Details*

| Parameter | Antegrade (n=30) | Retrograde (n=30) | p-value |
|---|---|---|---|
| **Cardiopulmonary bypass time (min)** | 198 ± 38 | 211 ± 42 | 0.131 |
| **Cross-clamp time (min)** | 132 ± 26 | 139 ± 30 | 0.247 |
| **Hypothermic Circulatory Arrest (min)** | 21.4 ± 5.2 | 25.6 ± 6.1 | 0.001* |
| **Cerebral perfusion technique** | 30 (100%) ACP | 30 (100%) RCP | – |

ACP: Antegrade Cerebral Perfusion; RCP: Retrograde Cerebral Perfusion; Min: Minutes

In agreement with our findings, Yoon et al. reported that their sample population had a mean average age of 61.8 years [7].

Both groups in our study showed a male predominance in their cohort, with an overall representation of 71.7% in the study. Generally, the prevalence of Aortic Dissection is more common in males compared to females because men generally have larger aortic diameters, higher rates of hypertension, and greater exposure to risk factors such as smoking, all of which increase wall stress on the ascending aorta. Also, hormonal and structural differences in connective tissue may also contribute, making the male aorta more prone to dissection [8].

The commonest observed comorbidity present in our cohorts was hypertension (81.7%). This is expected since hypertension is the principal risk factor for developing aortic dissections. In accordance with our findings, Yoon et al. reported that in their cohort of patients, nearly 72% had hypertension [7]. Similarly, Elbatarny et al. reported that hypertension was the most common prevalent risk factor in their study; present in 72% of the participants [9].

The rate of smoking was consistently high among the included participants 35 (58.3%). In the literature, smoking is an established risk factor that is independently associated with vascular emergencies. In alignment with our findings, Khan et al. in their analysis of 751 patients with aortic dissection, reported that nearly half of the patients (44.9%) had a pre-operative history of smoking [10].

Furthermore, in a recent review investigating the risk factors associated with aortic dissection, the authors reported that smoking accelerates atherosclerosis and is a major risk factor for aortic aneurysms and dissections [11].

The prevalence of diabetes mellitus in our study was relatively lower compared to the previous morbidities, as diabetes is more linked to endothelial atherosclerosis than it is linked to arterial dissection. In accordance with our results, Wang et al. reported that the prevalence of diabetes mellitus in their cohort was 15.7% [12]. Yoon et al. reported that diabetes mellitus was only associated with 9.6% of the total sample size [7].

Analysis of the pre-operative characteristics of the dissections in our study revealed that disease severity and presentation were similar and comparable, which ensures equitable surgical risk in both groups. Approximately 80% of the included patients in our study were classified as DeBakey type I, which indicates extensive aortic involvement and higher surgical risk and complexity. In accordance with our findings, Yoon et al. reported that approximately 81% of the cases in their study were presented with DeBakey type I [7].

In Press

*Table 4: Type of Surgery*

| Surgery Type | Antegrade (n=30) | Retrograde (n=30) | p-value |
|---|---|---|---|
| **Supracoronary graft (%)** | 10 (33.3%) | 12 (40%) | 0.592 |
| **Bentall procedure (%)** | 14 (46.7%) | 13 (43.3%) | 0.796 |
| **Bentall + Hemiarch (%)** | 4 (13.3%) | 3 (10%) | 0.685 |
| **Tirone David procedure (%)** | 2 (6.7%) | 2 (6.7%) | 1.000 |

*Table 5: Cannulation Site Distribution*

| Cannulation Site | Antegrade Group (n=30) | Retrograde Group (n=30) |
|---|---|---|
| **Innominate artery** | 12 (40%) | 0 |
| **Ascending aorta** | 10 (33.3%) | 0 |
| **Axillary artery** | 8 (26.7%) | 0 |
| **Femoral artery** | 0 | 30 (100%) |

Our results reported that nearly 36.7% of the patients were associated with moderate or worse aortic regurgitation (≥ grade II), while only 20% suffered from malperfusion syndrome. This reflects typical ascending aorta involvement affecting valve function and requiring surgical root intervention during repair.

Similar to our findings, Yoon et al. reported that Malperfusion was present in 7.5% of the total population, with a higher incidence with the retrograde group (8.8% vs 3.1%) [7].

In accordance with our findings, Elbatarny et al. reported that more than half of the patients suffered from aortic insufficiency (57.3%), while coronary malperfusion was present in 14% of the patients [9].

The utilized surgical procedures were similar and comparable between the two groups, with Bentall being the most commonly used approach (more than 55% of the cases).

Regarding the cannulation site itself, all of the patients in the retrograde group had femoral artery insertion, while preferred insertion sites in the antegrade group varied between the innominate (40%), ascending aorta (33.3%) and the axillary artery (26.7%).

In accordance with our findings, Yoon et al. also demonstrate a clear procedural preference tied to pathology: their cohort was dominated by ascending and hemi-arch procedures (76.7%), and when antegrade cannulation was used it was most often directly on the aorta (68.8%), with axillary and innominate used much less. That pattern contrasts with our antegrade group, where the innominate (40%) and ascending aorta (33.3%) were used more evenly and axillary access accounted for a larger share (26.7%). Like us, Yoon's retrograde cases were exclusively femoral, so both series agree that femoral access remains the default retrograde route; differences in antegrade site selection are plausibly explained by differences in case mix (higher proportion of hemi-arch/ascending repairs in Yoon) and local surgical preference [7].

Lemaire et al. found femoral cannulation to predominate (72.6%) with smaller proportions using axillary (15.6%) or direct aortic (11.9%) access. This distribution aligns with our finding that femoral access is a common and frequently used route — particularly for retrograde cannulation — but Lemaire's cohort shows an even stronger overall reliance on femoral access than ours. The relatively lower rates of axillary and direct-aortic cannulation in Lemaire may reflect center practice patterns or different proportions of emergent versus planned operations; by contrast, our antegrade group used a broader mix (innominate/ascending/axillary), suggesting a more heterogeneous antegrade strategy [13].

*Table 6: Postoperative Outcomes*

| Parameter | Antegrade (n=30) | Retrograde (n=30) | p-value |
|---|---|---|---|
| **Reoperation for bleeding (%)** | 2 (6.7%) | 3 (10%) | 0.500 |
| **Renal failure requiring dialysis (%)** | 4 (13.3%) | 6 (20%) | 0.371 |
| **Mechanical ventilation >48 h (%)** | 6 (20%) | 8 (26.7%) | 0.537 |
| **ICU stay (days, mean ± SD)** | 4.9 ± 2.1 | 6.2 ± 2.6 | 0.015* |
| **Hospital stay (days, mean ± SD)** | 10.4 ± 3.2 | 12.7 ± 3.6 | 0.006* |

In Press

*Table 7: Neurological Outcomes*

| Outcome | Antegrade (n=30) | Retrograde (n=30) | p-value |
|---|---|---|---|
| **Permanent neurological deficit (%)** | 1 (3.3%) | 5 (16.7%) | 0.088 |
| **Temporary neurological dysfunction (%)** | 3 (10%) | 6 (20%) | 0.227 |
| **Stroke (%)** | 1 (3.3%) | 4 (13.3%) | 0.177 |

Analysis of the intraoperative data found that both the antegrade and retrograde approaches had similar and comparable durations regarding the cardiopulmonary bypass (CPB) and cross clamp times (198 vs 211; p=0.131, 132 vs 193; p=0.247, respectively). This ensures that both procedures were similar regarding the procedural efficacy, and these durations are consistent with those previously published in the literature, which indicates that both approaches were successful in reducing the myocardial ischemic time and risk of post-operative myocardial dysfunction [14].

Another significant complication of CPB-related procedures is the risk of cerebral ischemia, as the brain of all organs can only tolerate limited periods of true arrest even in the presence of induced hypothermia and other adjunctive cerebral perfusion techniques [8].

In our study, the patients in the antegrade group were treated with the antegrade cerebral perfusion (ACP) technique as the main protective cerebral perfusion strategy, while patients in the retrograde group were given the retrograde cerebral perfusion (RCP) approach. It is well established that ACP generally provides physiological and controllable flow to the brain compared to RCP, thus it is widely considered to be the favorable approach. This is further confirmed by the analysis of the hypothermic circulatory arrest time in our study, which revealed that the antegrade approach was associated with statistically and clinically significant shorter times compared to the retrograde approach (21.4 vs 25.6m). Previous studies in the literature support keeping circulatory arrest <25-30 min for best neurologic outcomes [8].

Similar to our findings, Stamou et al. reported that mean hypothermic circulatory arrest times were 31 minutes with ACP versus 36 minutes with RCP, indicating that ACP is associated with significantly shorter arrest durations compared to RCP [15].

We can hypothesize the utilization of the ACP in the antegrade approach could improve the cerebral perfusion and protect against cerebral ischemia compared to the retrograde approach, evident by the shorter circulatory arrest times. However, it should be noted that this shorter time could be related to the utilization of ACP (which can be started immediately and efficiently, whereas RCP setup may prolong time in arrest) rather than being related to antegrade approach itself.

These theoretical neurological advantages with the antegrade approach did not translate to the clinical outcomes. As in our analysis of the post-operative outcomes, we observed that while the antegrade approach was associated with a trend toward lower incidents of permanent neurological deficit (3.3% vs 16.7%), temporary dysfunction (10% vs 20%) and stroke (3.3% vs 13.3%), this trend consisted mainly of numerical reduction and failed to reach statistical significance. In accordance with our findings, Yoon et al. reported that rates of stroke and spinal cord ischemia were low and comparable between the two procedures [7].

*Table 8: Postoperative mortality*

| Mortality Type | Antegrade (n=30) | Retrograde (n=30) | p-value |
|---|---|---|---|
| **In-hospital mortality (%)** | 2 (6.7%) | 5 (16.7%) | 0.227 |
| **30-day mortality (%)** | 3 (10%) | 6 (20%) | 0.227 |

In Press

Mortality analysis revealed that while patients in the antegrade group were associated with more numerical reduction in the mortality risk (in-hospital and 30-day), this superiority was only numerical, and it failed to achieve statistically significant difference between the two groups. In alignment with our findings, Wang et al. reported similar mortality risk between the two groups post-operation [12]. Also, Elbatarny et al. reported similar operative mortality patterns between the two groups (15.1% vs 14.1%) [9].

Further analysis of additional post-operative clinical outcomes revealed that both groups had similar rates of reoperation for bleeding (6.7% vs 10%; p=0.640) and Mechanical ventilation >48h (20% vs 26.7%; p=0.537). International reports suggest high perioperative bleeding is more linked to patient/surgery factors than cannulation site, while numerically shorter mechanical ventilation periods in the antegrade group might have a potential role in its faster recovery.

Femoral cannulation is generally associated with more malperfusion events that could lead to renal failure that requires dialysis. However, in our study we observed that there were no statistically significant differences between the retrograde femoral approach and the antegrade approaches regarding the rates of need for renal-failure-related dialysis (20% vs 13.3%; p=0.488).In accordance with our findings, Elbatarny et al. reported that the rates of post-operative acute kidney injury (AKI) and respiratory insufficiency were similar and comparable between the two approaches [9].

In our study, the antegrade approach was associated with faster recovery than the retrograde approach, evident by the clinically and statistically shorter periods of ICU stay (4.9 vs 6.2 d; p= 0.015) and hospital stay (10.4 vs 12.7 d; p=0.006).

In accordance with our findings, Yoon et al. reported that patients who were treated with the antegrade approach were associated with a shorter ICU stay compared to the retrograde approach (3 vs 5d) [9]. The antegrade approach likely shortens recovery periods through several complementary mechanisms that optimize perioperative physiology and minimize surgical trauma Furthermore, more efficient surgical workflow enabled by antegrade access allows for shorter operative times and circulatory arrest periods, as demonstrated by the significantly shorter hypothermic circulatory arrest time. Thus, the combination of better organ preservation, reduced surgical stress, and optimal cerebral protection creates a synergistic effect that accelerates postoperative recovery [16]. On the other hand, Wang et al. did not find any statistically significant difference between the two approaches regarding reducing the length of ICU stay [12].

These contradictory findings may reflect differences in patient selection, surgical complexity, institutional protocols, and the heterogeneity of cannulation techniques grouped under "antegrade" approaches.

The findings provide important guidance for cardiovascular surgeons managing acute type A aortic dissection, supporting both antegrade and retrograde perfusion strategies as viable approaches. While major clinical outcomes including mortality, neurological complications, and renal failure showed no statistically significant differences, the antegrade approach demonstrated meaningful advantages in procedural efficiency and recovery metrics. The significantly shorter hypothermic circulatory arrest time with antegrade perfusion (21.4 vs 25.6 minutes) aligns with current ESC and STS guidelines recommending circulatory arrest duration below 25-30 minutes for optimal neurological outcomes. Surgical teams should maintain competency in both approaches, as patient anatomy, pathology extent, and institutional expertise should guide strategy selection rather than a uniform preference for either technique [16].

The statistically significant reductions in ICU stay (4.9 vs 6.2 days) and total hospital stay (10.4 vs 12.7 days) with antegrade perfusion have substantial healthcare economic implications and improved resource allocation potential. These recovery advantages, combined with the

In Press

consistent numerical trends favoring antegrade approaches in neurological outcomes, suggest that antegrade perfusion should be considered the preferred strategy when anatomically feasible and surgeon expertise permits. However, the comparable safety profiles ensure that retrograde approaches remain appropriate alternatives, particularly in emergency situations where rapid intervention takes precedence. Centers should track these recovery metrics as quality indicators and develop standardized protocols that incorporate these evidence-based advantages while maintaining flexibility for individualized patient care [17].

## Limitations

This study is limited by the relatively small number of cases included (Post-hoc sample size calculation) and by the relatively short follow-up period. Study in a larger number of cases and with a longer follow-up period is advisable. Also, The heterogenicity of the population and different surgeons involved.

## Conclusion

Antegrade and retrograde cannulation both remain safe and effective strategies in managing acute type A aortic dissection. Antegrade approaches showed meaningful advantages in procedural efficiency, cerebral protection, and recovery outcomes. When pathology and surgical expertise permit, antegrade cannulation should be favored. while retrograde access remains a reliable option in emergency cases.

**Funding:** Self-funded
**Conflict of interest:** Authors declare no conflict of

In Press

## References

1. Golledge J, Eagle KA. Acute aortic dissection. Lancet. 2008; 372(9632): 55–66.
2. Siegal EM. Acute aortic dissection. Journal of Hospital Medicine. 2006; 1(2): 94–105.
3. Bonser RS, Ranasinghe AM, Loubani M, et al. Evidence, lack of evidence, controversy, and debate in the provision and performance of the surgery of acute type A aortic dissection. J Am Coll Cardiol. 2011; 58(23): 2455–2474.
4. Shimokawa T, Takanashi S, Ozawa N, Tsuyoshi Itoh. Management of intraoperative malperfusion syndrome using femoral artery cannulation for repair of acute type A aortic dissection. Ann Thorac Surg. 2008; 85(5): 1619–1624.
5. Conzelmann LO, Krüger T, Hoffmann I, et al. German Registry for Acute Aortic Dissection Type A (GERAADA): Initial results. Herz. 2011; 36(6), 513–524.
6. Hagan PG, Nienaber CA, Isselbacher EM, et al. The International Registry of Acute Aortic Dissection (IRAD): New insights into an old disease. JAMA. 2000; 283(7): 897–903.
7. Yoon T, Lee HS, Jang JS, Cho JW, Lee CH. Exploring Differences in Surgical Outcomes Depending on the Arterial Cannulation Strategy for Acute Type A Aortic Dissection: A Single-Center Study. Journal of Chest Surgery. 2024; 57(4): 380–386.
8. Zhu Y, Lingala B, Baiocchi M, et al. Type A Aortic Dissection-Experience Over 5 Decades: JACC Historical Breakthroughs in Perspective. Journal of the American College of Cardiology. 2020; 76(14): 1703–1713.
9. Elbatarny M, Trimarchi S, Korach A, et al. Axillary vs Femoral Arterial Cannulation in Acute Type A Dissection: International Multicenter Data. The Annals of Thoracic Surgery. 2024; 117(6): 1128–1134.
10. Khan MYI, Dillman A, Sanchez-Perez M, Hibino M, Aune D. Tobacco smoking and the risk of aortic dissection in the UK Biobank and a meta-analysis of prospective studies. Scientific Reports. 2025; 15(1): 12083.
11. Kano HD, Sun W. Risk Factors for Aortic Dissection. US Cardiology Review. 2023; 17: e17.
12. Wang Z, Yu Y, Xie X, Wan L, Wang L, Yin J. Comparison of outcomes between axillary and femoral artery cannulation for type A aortic dissection surgery. Journal of Cardiothoracic Surgery. 2025; 20(1): 236.
13. Lemaire A, Levine D, Chao J, et al. Does arterial cannulation site for aortic dissection repair impact surgical outcomes? Journal of Thoracic Disease. 2023; 15(3): 1057–1062.
14. Evangelista A, Maldonado G, Gruosso D, Teixido G, Rodríguez-Palomares J, Eagle K. Insights from the International Registry of Acute Aortic Dissection. Global Cardiology Science & Practice. 2016; 1: e201608.

15. Stamou SC, Rausch LA, Kouchoukos NT, et al. Comparison between antegrade and retrograde cerebral perfusion or profound hypothermia as brain protection strategies during repair of type A aortic dissection. Annals of Cardiothoracic Surgery. 2016; 5(4): 328–335.
16. Czerny M, Berger T, Aboyans, et al. EACTS/STS Guidelines for Diagnosing and Treating Acute and Chronic Syndromes of the Aortic Organ. The Annals of Thoracic Surgery. 2024; 118(1): 5–115.
17. Carrel T, Sundt TM, von Kodolitsch Y, Czerny M. Acute aortic dissection. Lancet (London, England). 2023; 401(10378), 773–788.

In Press