Long-term outcome of aortic dissection associated with aberrant subclavian artery and Kommerell's diverticulum

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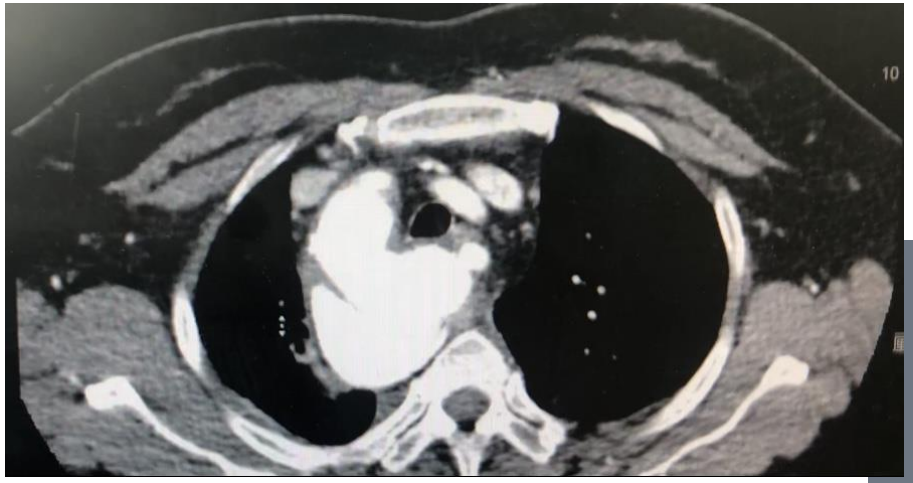
CONTENT

Background



- Aberrant subclavian artery (aSA) is a rare anomaly of the aortic branches, with an incidence rate of approximately 2% in the population[1].
- Approximately 60-82% of patients with aberrant right or left subclavian artery have an associated Kommerell's diverticulum (KD)[2].
- aSA and KD increase the risk of aortic rupture (4%-19%)[3] and aortic dissection (11%-53%)[4].

1. Giuliani L, et al. *J Am Coll Cardiol*. 2023;81(10):979-991.

2. Natsis K, et al. *Surg Radiol Anat*. 2017;39(5):559-565.

3. Vinnakota A, et al. *The Annals of Thoracic Surgery*. 2019;108(6):1745-1750.

4. Yousef S, et al. *J Card Surg*. 2021;36(7):2348-2354.

Background

KD is believed to be a persistent remnant of the fourth primitive dorsal aortic arch due to failed regression[5].

Degenerative non-inflammatory changes in organelles, including mild dilation of rough endoplasmic reticulum and mitochondrial swelling and degradation, have been observed under transmission electron microscopy[6].

5. Luciano D, et al. *The Annals of Thoracic Surgery*. 2015;100(6):2293-2297.

6. Nishioka N, et al. *Ann Vasc Surg*. 2021;74:525.e1-525.e6.

Objective

01 There have been limited retrospective cohort studies primarily focused on the treatment of aSA with KD, with only a few cases involving concomitant aortic dissection.

02 This study aims to investigate the clinical characteristics, surgical treatment, and long-term follow-up outcomes of patients with aortic dissection associated with aSA through standardized data reporting.

Methods

Between 2011 and 2021, a total of 48 patients with aSA anomalies underwent aortic dissection intervention.

DATA	Followed the recommendations proposed by Konstantinou for reporting items in future studies and publications reporting on treatments of aSA pathologies: (SILT checklist)[7].
Operation	Open surgery and minimally invasive treatment.
Statistical	Cox regression analysis, Kaplan-Meier method and the log-rank test.

7. Konstantinou N, et al.*European Journal of Vascular and Endovascular Surgery*. 2022;63(5):759-76

Results

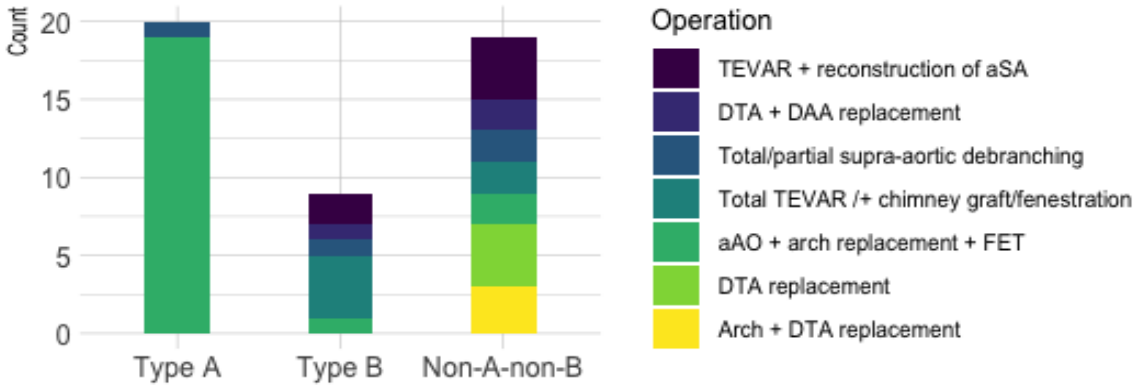
Patient demographic characteristics

Variable	Overall (n = 48)	Type A (n = 20)	Type B (n = 9)	Non-A-non-B (n = 19)	*p* value
Age at operation (years)	48.81 (9.65)	48.15 (10.26)	50.67 (8.63)	48.63 (9.83)	0.812
Male gender	35 (72.9)	16 (80.0)	6 (66.7)	13 (68.4)	0.644
Weight (kg)	74.83 (13.82)	74.98 (13.54)	81.89 (15.08)	71.32 (12.91)	0.168
Height (cm)	169.54 (7.04)	171.15 (8.29)	168.22 (4.87)	168.47 (6.42)	0.416
BMI (kg/m2)	26.01 (4.37)	25.58 (3.96)	28.93 (5.29)	25.07 (3.93)	0.076
BMI group					0.249
Normal	21 (43.8)	10 (50.0)	1 (11.1)	10 (52.6)	
Overweight	19 (39.6)	7 (35.0)	5 (55.6)	7 (36.8)	
Obese	8 (16.7)	3 (15.0)	3 (33.3)	2 (10.5)	
Hypertension	38 (79.2)	18 (90.0)	7 (77.8)	13 (68.4)	0.251
Diabetes	1 (2.1)	0 (0.0)	0 (0.0)	1 (5.3)	0.459
Coronary artery disease	7 (14.6)	3 (15.0)	2 (22.2)	2 (10.5)	0.713
Hyperlipidemia	15 (31.2)	4 (20.0)	6 (66.7)	5 (26.3)	0.036
Marfan syndrome	1 (2.1)	0 (0.0)	1 (11.1)	0 (0.0)	0.109
Moderate or severe AVR	10 (21.3)	7 (36.8)	1 (11.1)	2 (10.5)	0.1
Smoker (active/past)	23 (47.9)	9 (45.0)	5 (55.6)	9 (47.4)	0.869
COPD	2 (4.2)	1 (5.0)	1 (11.1)	0 (0.0)	0.378
History of stroke	1 (2.1)	0 (0.0)	0 (0.0)	1 (5.3)	0.459
Prior cardiac intervention	4 (8.3)	2 (10.0)	0 (0.0)	2 (10.5)	0.603
Symptoms on presentation					
Chest or back pain	39 (81.2)	17 (85.0)	8 (88.9)	14 (73.7)	0.537
Abdominal pain	12 (25.0)	7 (35.0)	1 (11.1)	4 (21.1)	0.341
Other syndrome	7 (14.6)	2 (10.0)	1 (11.1)	4 (21.1)	0.588
ALT (IU/L)	19.50 [13.75, 42.25]	24.00 [14.75, 42.25]	21.00 [15.00, 40.00]	17.00 [13.00, 42.50]	0.866
AST (IU/L)	22.00 [18.00, 33.50]	25.00 [17.75, 33.50]	22.00 [21.00, 24.00]	22.00 [17.00, 33.00]	0.97
Creatinine (IU/L)	75.76 [61.23, 91.01]	85.78 [75.45, 97.01]	68.90 [65.70, 74.04]	70.78 [53.66, 82.75]	0.074

BMI: body mass index; AVR: aortic valve regurgitation; COPD: chronic obstructive pulmonary disease; ALT: alanine transaminase; AST: aspartate aminotransferase.

Among the cases, patients with Stanford type B dissection had a higher incidence of hyperlipidemia compared to those with Stanford type A and non-A non-B dissections. Otherwise, there were no significant differences in baseline characteristics and presenting symptoms among the different types of dissections.

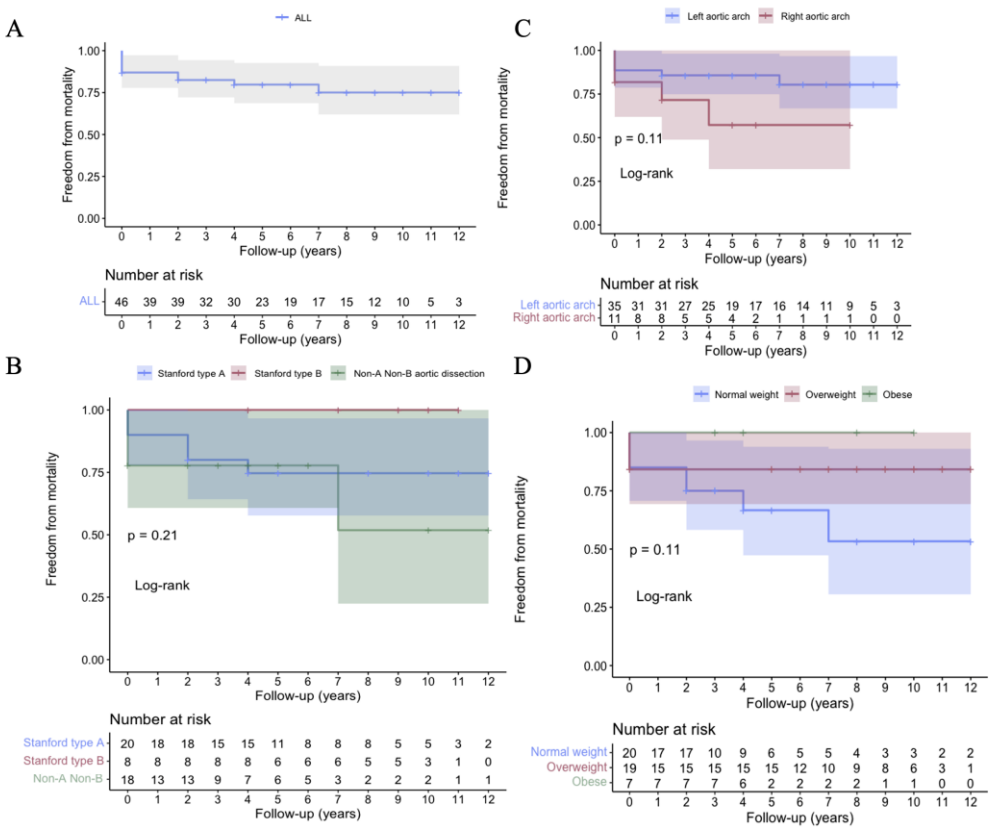
Results



There are various intervention methods for the management of aSA combined with aortic dissection.

TEVAR: thoracic endovascular aortic repair; aSA: aberrant subclavian artery; DTA: descending thoracic aorta; DAA: descending abdominal aorta; aAO: ascending aorta; FET: frozen elephant trunk.

The estimated Kaplan-Meier survival rates at 1 year, 3 years, 5 years, and 7 years after surgery were respectively 87.0%, 82.5%, 79.7%, and 75.1%.



Results

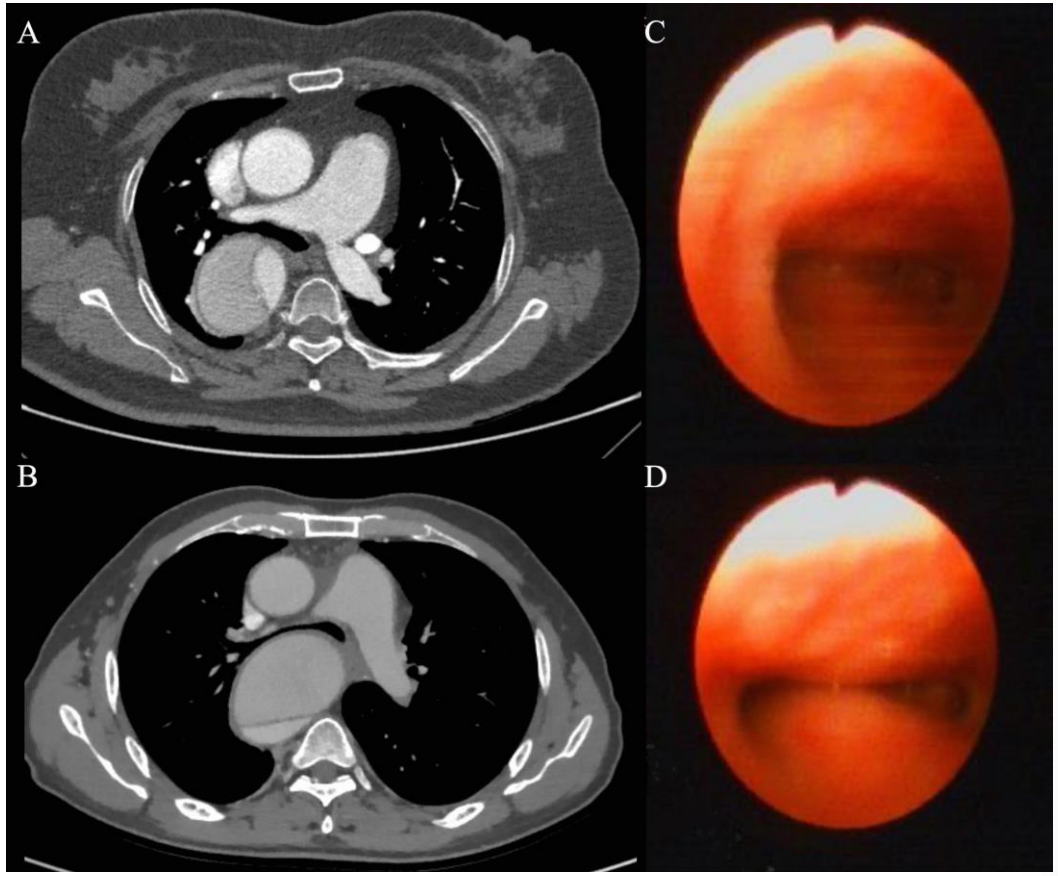
Postoperative Outcomes

Variable	Overall (n = 48)	Type A (n = 20)	Type B (n = 9)	Non-A-non-B (n = 19)	*p* value	Left aortic arch (n = 37)	Right aortic arch (n = 11)	*p* value
Operative mortality					0.263			0.897
No	42 (87.5)	18 (90.0)	9 (100.0)	15 (78.9)		33 (89.2)	9 (81.8)	
Yes	6 (12.5)	2 (10.0)	0 (0.0)	4 (21.1)		4 (10.8)	2 (18.2)	
Overall mortality					0.232			0.307
No	38 (79.2)	15 (75.0)	9 (100.0)	14 (73.7)		31 (83.8)	7 (63.6)	
Yes	10 (20.8)	5 (25.0)	0 (0.0)	5 (26.3)		6 (16.2)	4 (36.4)	
CNS complications					0.831			0.759
No	40 (83.3)	16 (80.0)	8 (88.9)	16 (84.2)		30 (81.1)	10 (90.9)	
Yes	8 (16.7)	4 (20.0)	1 (11.1)	3 (15.8)		7 (18.9)	1 (9.1)	
Return OR					0.473			0.691
No	43 (89.6)	17 (85.0)	9 (100.0)	17 (89.5)		34 (91.9)	9 (81.8)	
Yes	5 (10.4)	3 (15.0)	0 (0.0)	2 (10.5)		3 (8.1)	2 (18.2)	
Reintervention					0.667			0.383
No	41 (85.4)	16 (80.0)	8 (88.9)	17 (89.5)		33 (89.2)	8 (72.7)	
Yes	7 (14.6)	4 (20.0)	1 (11.1)	2 (10.5)		4 (10.8)	3 (27.3)	
Peripheral nerve injury					0.203			0.073
No	46 (95.8)	20 (100.0)	9 (100.0)	17 (89.5)		37 (100.0)	9 (81.8)	
Yes	2 (4.2)	0 (0.0)	0 (0.0)	2 (10.5)		0 (0.0)	2 (18.2)	
SSS					0.406			0.897
No	42 (87.5)	17 (85.0)	7 (77.8)	18 (94.7)		33 (89.2)	9 (81.8)	
Yes	6 (12.5)	3 (15.0)	2 (22.2)	1 (5.3)		4 (10.8)	2 (18.2)	
Respiratory complications					0.087			0.01
No	45 (93.8)	20 (100.0)	9 (100.0)	16 (84.2)		37 (100.0)	8 (72.7)	
Yes	3 (6.2)	0 (0.0)	0 (0.0)	3 (15.8)		0 (0.0)	3 (27.3)	
Ventilation time (min)	20.50 [13.00, 89.75]	52.50 [17.25, 95.75]	14.00 [10.00, 17.50]	20.00 [12.50, 86.50]	0.11	18.00 [13.00, 60.00]	61.00 [20.50, 156.00]	0.068
Length of stay (days)	4.00 [2.00, 7.25]	5.00 [2.00, 8.00]	2.00 [1.00, 5.00]	4.00 [1.50, 7.00]	0.208	4.00 [1.00, 6.00]	7.00 [3.00, 12.50]	0.062

CNS: central nervous system; OR: operating room; SSS: subclavian steal syndrome.

The operative mortality rate was 12.5%. The overall mortality rate was 20.8%, with a median follow-up time of 4.5 years (IQR: 2-8.75 years). Preoperative coronary artery atherosclerotic heart disease was identified as a factor associated with operative mortality (OR=2.57, P=0.017). Central nervous system complications occurred in 8 patients (16.7%), subclavian steal syndrome in 6 patients (12.5%), and respiratory complications in 3 patients (6.2%).

Results



- 2 patients with the right aortic arch and left aSA developed compression of the right main bronchus, leading to lung infection and ultimately respiratory failure and death. Both cases showed compression of the right main bronchus on preoperative CT imaging.
- The incidence of respiratory complications in patients with the right aortic arch was significantly higher than that in patients with the left aortic arch (P=0.01).
- The possibility of a complete vascular ring in patients with the right aortic arch, the trachea may be more susceptible to compression by the vascular ring or the enlarged false lumen and KD.

Conclusions

Patients with aSA combined with KD have higher early and long-term mortality and higher rates of postoperative complications when they develop aortic dissection. Intervention before the occurrence of aortic dissection for patients with aSA and KD should be considered. Once aortic dissection occurs, individualized intervention strategies should be formulated based on preoperative characteristics, including age, general condition, type of dissection, and imaging characteristics.

THANKS FOR YOUR ATTENTION

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