

Clinical Characteristics and CT Findings in Adult Patients with an Aberrant Right Subclavian Artery: A Single-Center Retrospective Cohort Study

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BACKGROUND

An aberrant right subclavian artery (ARSA) is an anomalous artery that arises from the descending aorta distal to the left subclavian. Although most ARSA are discovered incidentally given the absence of symptoms, they may be associated with significant morbidity and mortality.

METHODS

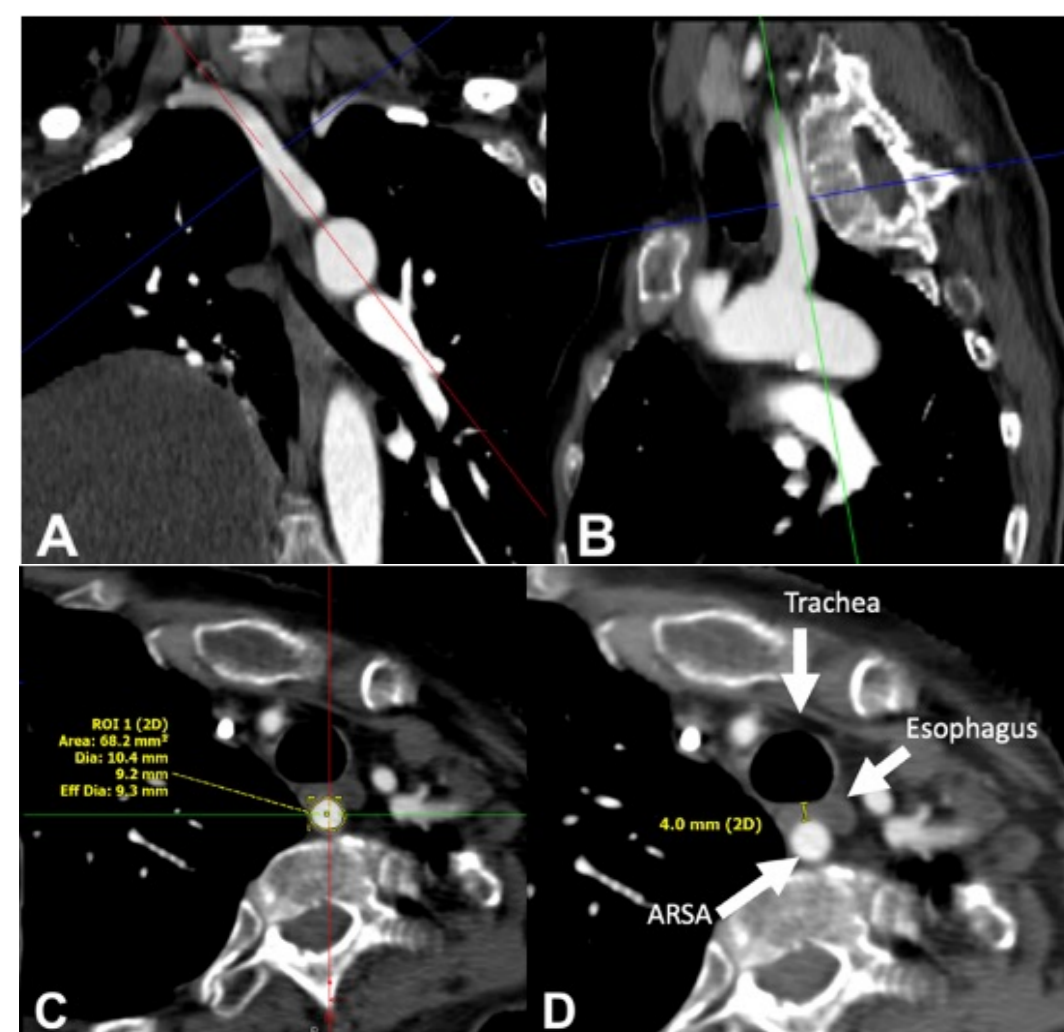
Retrospective study at Mayo Clinic Florida of all patients undergoing CT chest imaging between June 2016 to April 2021. Inclusion criteria: 1) CT chest imaging performed, 2) ARSA diagnosed on CT imaging, 3) 18 years or older. Excluded if any of above not met.

The primary outcome were symptoms at diagnosis. Symptoms related to the ARSA included dysphagia, dyspnea, cough, or upper airway wheezing.

Four cardiothoracic radiologists reviewed the chest CT scans to measure features of ARSA.

Agreement and multivariable logistic regression analyses were performed to determine interobserver variability and features associated with the presence of symptoms, respectively.

Figure 1: Panels A, B, and C show multiplanar reformats to obtain measurements of ARSA at the level of crossing the esophagus. Panel D shows measurement of the distance between ARSA and posterior wall of trachea



The prevalence of ARSA was 1.02% across all patients undergoing CT chest imaging and 81.3% were asymptomatic at diagnosis.

Table 1: Evaluation of Associations of Patient and CT Characteristics with Being Symptomatic

	Association with being symptomatic					
	Median (IQR) or fraction (%) of patients		Unadjusted analysis		Multivariable analysis	
	Symptomatic N = 59	Asymptomatic N = 257	OR (95% CI)	p-value	OR (95% CI)	p-value
Age at diagnosis, years (10-year increase)	60.0 (43.9-68.5)	57.3 (41.5-67.3)	1.08 (0.91-1.29)	0.41	1.00 (0.83-1.21)	0.83
Male	25/59 (42.4%)	85/257 (33.1%)	1.49 (0.83-2.65)	0.18	1.12 (0.60-2.11)	0.73
Weight, kg (10 kg increase)	78.9 (63.3-90.5)	76.5 (62.5-90.7)	0.98 (0.86-1.11)	0.77	0.98 (0.86-1.12)	0.78
Height, cm (10 cm increase)	167 (160.0-175.0)	167 (160.0-173.0)	1.14 (0.89-1.46)	0.29	1.13 (0.88-1.48)	0.37
o Height > 158 cm	54/59 (91.5%)	205/254 (80.7%)	2.58 (1.07-7.70)	0.03	2.50 (1.01-7.54)	0.034
Body mass index, kg/m ² (5 kg/m ² increase)	25.8 (22.4-30.3)	26.7 (22.9-32.4)	0.93 (0.76-1.05)	0.46	0.98 (0.86-1.11)	0.74
Obesity	16/58 (27.6%)	83/254 (32.7%)	0.78 (0.42-1.48)	0.45	1.09 (0.56-2.15)	0.80
White race	53/59 (89.8%)	206/251 (82.1%)	2.19 (0.96-5.93)	0.09	1.95 (0.83-5.38)	0.15
Ethnicity, Hispanic/Latino	3/59 (5.1%)	21/257 (8.2%)	0.60 (0.17-2.09)	0.42	0.93 (0.25-3.50)	0.92
Family History, negative	57/59 (96.6%)	230/257 (89.5%)	3.35 (0.77-14.48)	0.10	2.29 (0.63-14.78)	0.28
Type of CT scan performed						
o Chest CT Angiogram	31/59 (52.5%)	122/257 (47.8%)	1.00 (reference)		1.00 (reference)	
o Contrast Chest CT	28/59 (47.5%)	133/257 (52.2%)	0.83 (0.47-1.46)	0.52	0.61 (0.33-1.12)	0.11
Diameter at origin max, mm (10 mm increase)	17 (14.0-19.0)	16 (13.0-18.0)	1.21 (0.63-2.34)	0.57	0.93 (0.42-2.07)	0.86
Diameter at origin min, mm (10 mm increase)	14 (11.5-17.0)	13 (11.0-16.0)	1.32 (0.65-2.67)	0.45	0.98 (0.43-2.27)	0.97
Cross-sectional area at origin, mm ² (50 mm ² increase)	166 (122.5-240.5)	150 (109.0-215.0)	1.03 (0.90-1.18)	0.67	0.98 (0.84-1.15)	0.81
Diameter at crossing of esophagus max, mm (10 mm increase)	12 (10.0-13.5)	11 (10.0-13.0)	1.03 (0.50-2.10)	0.94	0.76 (0.25-2.34)	0.63
Diameter crossing of esophagus min, mm (10 mm increase)	10 (9.0-12.0)	10 (8.0-12.0)	1.23 (0.56-2.69)	0.60	0.76 (0.25-2.34)	0.45
Cross-sectional area at crossing of esophagus, mm ² (50 mm ² increase)	88 (68.0-120.0)	85 (59.0-120.0)	1.06 (0.83-1.36)	0.63	1.03 (0.76-1.35)	0.85
o Area > 60 mm ²	52/59 (88.1%)	189/257 (73.5%)	2.67 (1.23-6.70)	0.02	2.39 (1.08-6.06)	0.046
Distance between ARSA and trachea, mm (1 mm increase)	5 (2.5-6.0)	5 (3.0-6.0)	0.91 (0.81-1.02)	0.11	0.85 (0.75-0.97)	0.02
o Distance ≤ 7 mm	53/59 (89.8%)	213/257 (82.9%)	1.83 (0.79-4.97)	0.19	2.24 (0.88-5.73)	0.09
Angle of Proximate ARSA with the Arch, degrees (10-degree increase)	110 (90.0-121.0)	101 (73.0-118.0)	1.09 (0.99-1.21)	0.08	1.08 (0.98-1.20)	0.14
o Angle > 108 degrees	32/59 (54.2%)	96/257 (37.4%)	1.99 (1.12-3.54)	0.02	1.90 (1.06-3.42)	0.032
Presence of Kommerell aneurysm	2/59 (3.4%)	4/257 (1.6%)	2.22 (0.40-12.41)	0.36	2.26 (0.39-13.07)	0.36
Presence of atherosclerotic plaque within ARSA	23/59 (39.0%)	77/257 (30.0%)	1.49 (0.83-2.69)	0.18	1.31 (0.69-2.47)	0.41
Severity of atherosclerotic plaque						
o Mild	14/23 (60.9%)	49/77 (63.6%)	1.00 (reference)		1.00 (reference)	
o Moderate	6/23 (26.1%)	23/77 (29.9%)	0.91 (0.31-2.68)	0.87	0.73 (0.23-2.32)	0.59
o Severe	3/23 (13.0%)	5/77 (6.5%)	2.10 (0.45-9.89)	0.35	1.82 (0.35-9.38)	0.47
Presence of thrombus within ARSA	0/59 (0.0%)	3/257 (1.2%)	NA	1.00	NA	NA
Presence of proximal esophagus dilation	0/59 (0.0%)	23/257 (8.9%)	NA	0.01	NA	NA

ORs correspond to the increase given in parenthesis (continuous variables) or presence of the given characteristic (categorical variables). Logistic regression was not possible for presence of thrombus within ARSA and presence of proximal esophagus dilation due to zero cell counts; p-values result from Fisher's exact test. Family history included aortic aneurysm, congenital heart disease, or aberrant vessels. Continuous variables were examined on the continuous scale but were also dichotomized based on the value with the highest Youden Index on the Receiver Operating Characteristic Curve in unadjusted logistic regression. Multivariable logistic regression models were adjusted for all variables that were associated with being symptomatic with a p-value ≤ 0.10 in unadjusted logistic regression analysis (where such analysis was possible). These variables included height > 158cm, cross-sectional area at crossing with esophagus > 60mm², angle of proximate ARSA with aortic arch >108 degrees, negative family history, and race.

OBJECTIVE & HYPOTHESIS

- We sought to determine features associated with symptoms in adult patients diagnosed with an aberrant right subclavian artery.
- We hypothesized features related to anatomical compression of the esophagus or trachea would be associated with symptoms.

RESULTS

- The prevalence of ARSA was 1.02% and 81.3% of patients were asymptomatic.
- Shortness of breath (74.6%) and dysphagia (18.6%) were the most common symptom.
- Interobserver agreement amongst the reading radiologists was acceptable with most variables having an interclass correlation coefficient or kappa > 0.80.
- A patient's height > 158 cm (OR: 2.50, P=0.03), cross-sectional area > 60 mm² of ARSA at the level of the esophagus (OR: 2.39, P=0.046), distance increase per 1 mm between ARSA and trachea (OR: 0.85, P=0.02), and angle > 108 degrees formed with the aortic arch (OR: 1.99, P=0.03) were associated with symptoms. **Table 1.**

CONCLUSIONS

- In our single center study, we found being taller, having a larger cross-sectional area of ARSA at the level of the esophagus, a greater angle at the junction with the aortic arch, and a shorter distance between the ARSA and trachea, were associated with the presence of symptoms.
- Having a dilated esophagus, and/or atherosclerosis were not associated with symptoms.
- Importantly, the absence of dysphagia should not rule out an ARSA.
- These findings may help to predict which patients will develop symptoms and potentially become candidates for surgical consideration.