

**Catheter Ablation for Atrial Fibrillation in Adult Congenital Heart Disease:
An International Multi-Center Registry Study**

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ABSTRACT

Background: Life expectancies for patients with congenital heart disease (CHD) have dramatically increased in recent years, accompanied by a rise in atrial fibrillation (AF) prevalence. Data on AF ablation strategy and outcomes are limited in CHD.

Objective: We aimed to investigate the characteristics of CHD patients presenting for AF ablation and their outcomes.

Methods: A multicenter, retrospective analysis was performed of CHD patients undergoing AF ablation between 2004 and 2020 at 13 participating centers. The severity of CHD was classified using the 2014 PACES/HRS guidelines. Clinical data were collected including ablation strategy and follow-up. One-year complete procedural success was defined as freedom from atrial tachycardia or AF in the absence of antiarrhythmic drugs (AADs) or including previously failed AADs (partial success).

Results: Of 240 patients, 127 (53.4%) had persistent AF, 62.5% were male, and mean age was 55.2 ± 0.9 years. CHD complexity categories included 147 (61.3%) simple, 69 (28.8%) intermediate and 25 (10.4%) severe. The most common CHD type was atrial septal defect (n=78). More complex CHD conditions included transposition of the great arteries (n=14), anomalous pulmonary veins (n=13), tetralogy of Fallot (n=8), cor triatriatum (n=7), single ventricle physiology (n=2), among others. The majority (71.3%) of patients had trialed at least one AAD. Forty-six patients (22.1%) had a reduced systemic ventricular ejection fraction $< 50\%$, and the mean left atrial diameter was 44.1 ± 0.7 mm. Pulmonary vein isolation (PVI) was performed in 227 patients (94.6%); additional ablation strategies included left atrial linear ablations (25.4%), CFAE (19.2%), and cavotricuspid isthmus ablation (40.8%). One-year complete and partial success rates were 45.0% and 20.5%, respectively, with no significant difference in the rate of complete success between complexity groups. Overall, 38 patients (15.8%) required more than one ablation procedure. There were 3 (1.3%) major and 13 (5.4%) minor procedural complications.

Conclusions: AF ablation in CHD was safe and resulted in AF control in the majority of patients, regardless of complexity. Future work should address the most appropriate ablation targets in this challenging population.

FIGURE LEGEND

Figure 1. Classification of CHD complexity in patients who had undergone AF ablation.

Figure 2. Complete and partial success rates of AF ablation in congenital heart disease (CHD).

Figure 1

Simple complexity (n=147)	Moderate complexity (n=68)	Severe complexity (n=25)
ASD (n=78) Bicuspid AV (n=45) VSD (n=11) Persistent left SVC (n=9) Isolated IVC abnormalities (n=4) Situs inversus (n=3) Isolated dextrocardia (n=2) Isolated MV disease (n=1) Isolated AV disease (n=1)	Anomalous PV (n=13) PV stenosis (n=13) Coarctation of the aorta (n=9) Ebstein anomaly (n=8) Tetralogy of Fallot (n=8) AVSD (n=7) Cor triatriatum (n=7) Subaortic stenosis (n=6) Cleft mitral valve (n=1)	Transposition of great arteries (n=7) ccTGA (n=7) Tricuspid atresia (n=6) Heterotaxy Syndrome (n=3) Single ventricle (n=2) Double ventricle (n=2) Crisscross heart (n=1) Truncus arteriosus (n=1) PVOD (n=1) Shone syndrome (n=1)
1 year complete freedom = 45.0% 1 year partial freedom = 22.1%	1 year complete freedom = 41.5% 1 year partial freedom = 20.0%	1 year complete freedom = 54.2% 1 year partial freedom = 12.5%

Patients with multiple CHD were classified based on the most complex abnormality. 6 patients had more than one severe lesion, 4 patients had more than one moderate lesion, and 10 patients had more than one simple lesion; ASD, atrial septal defect; AV, = aortic valve; AVSD = atrioventricular septal defect; ccTGA = congenitally corrected transposition of the great arteries; IVC = inferior vena cava; MV = mitral valve; PV = pulmonary veins; PVOD = pulmonary vascular obstructive disease; SVC = superior vena cava; VSD = ventricular septal defect.

Figure 2

