

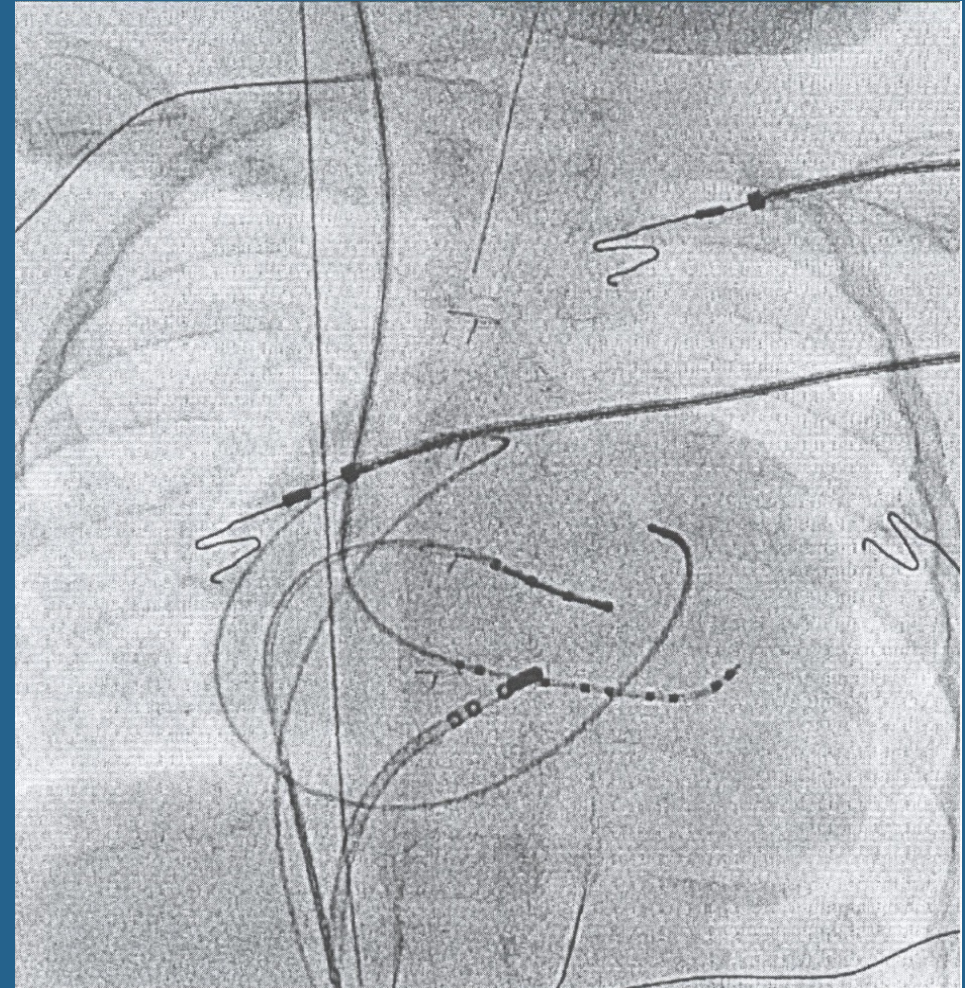
Indications and timing of AVNRT ablation in children

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Cryoablation in small child with AVNRT

- 17 mo old, 8 kg pt with Ebstein-like TV, SVT in preoperative period
- Scheduled to undergo TV plasty, RMBTS take-down, LPV plasty and ASD closure
- Typical AVNRT induced at EPS
- Cryoablation performed with 4 mm tip catheter
- Pt underwent uncomplicated surgery and has been SVT-free for 1 yr post-ablation



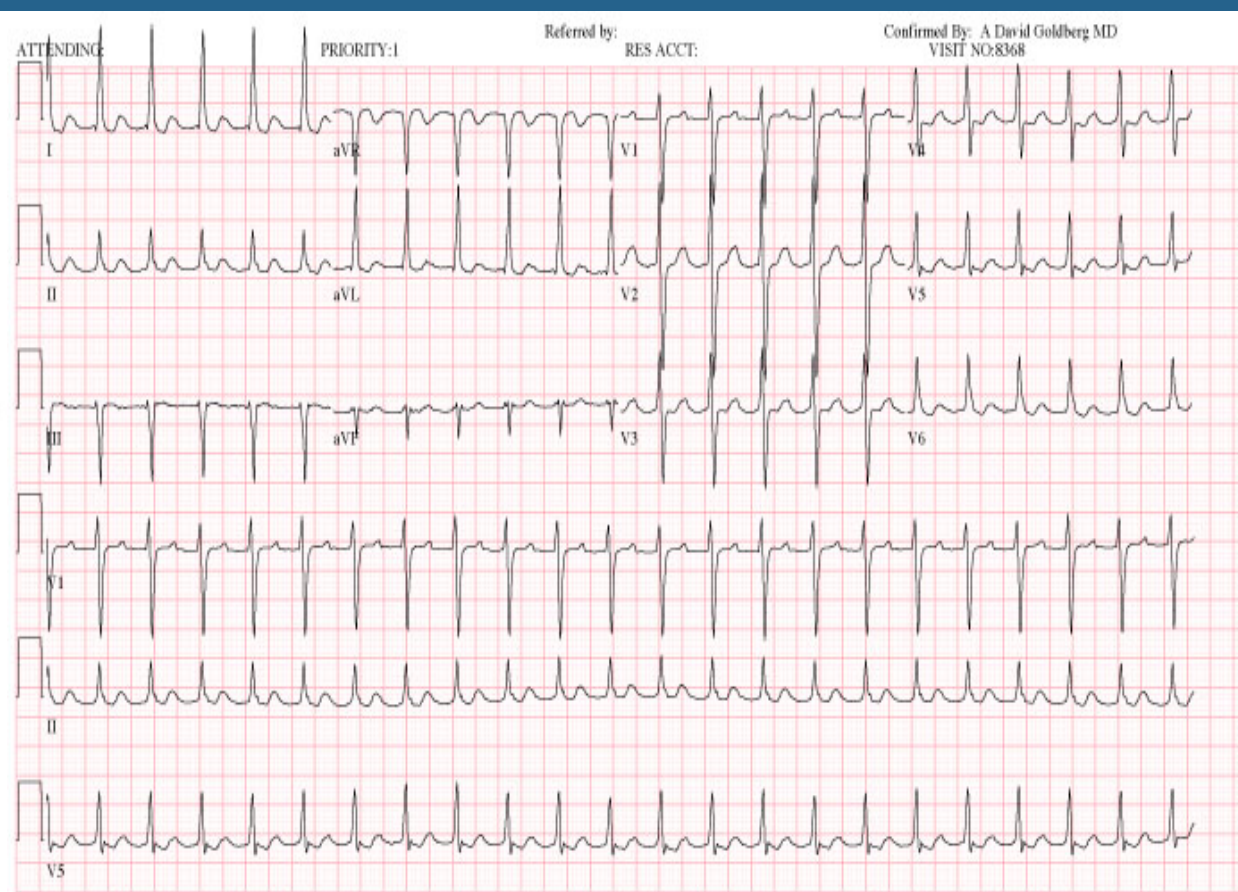
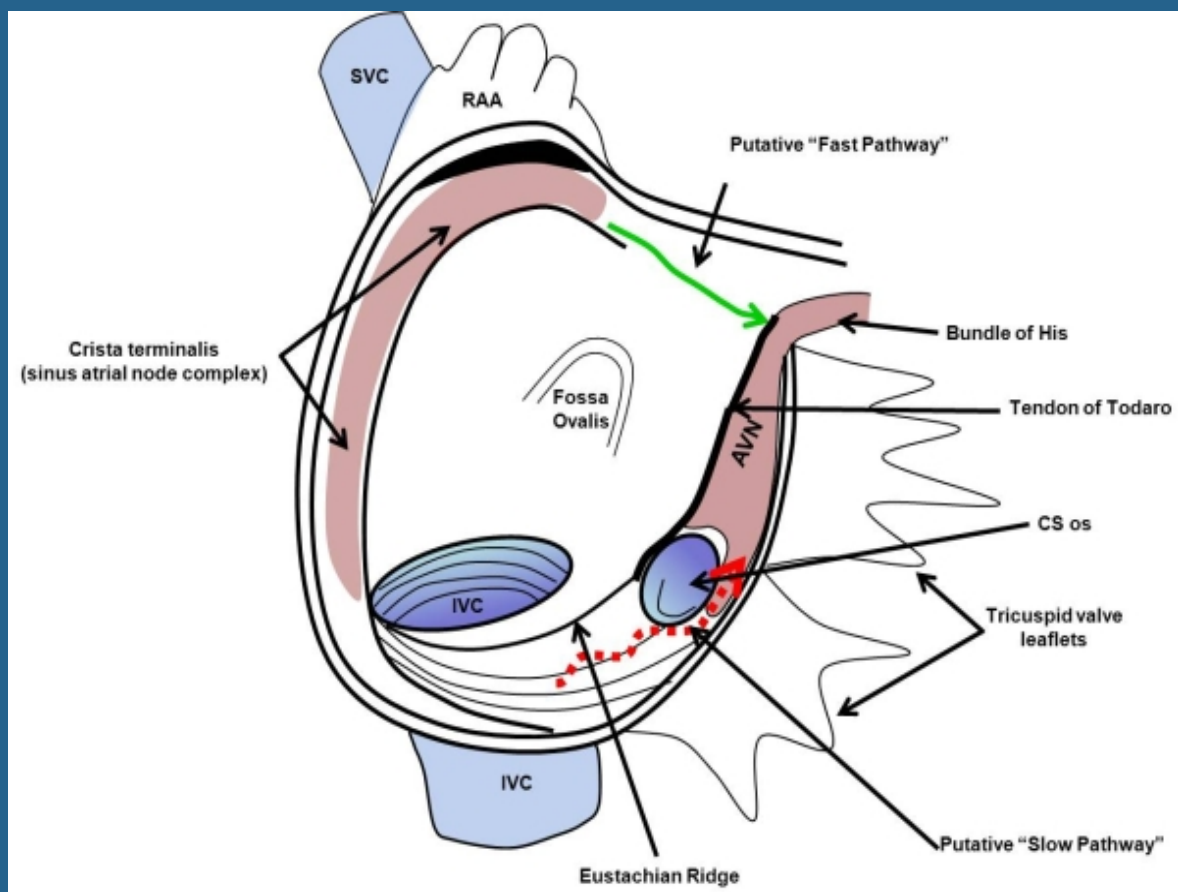
Ebstein-like TV patient

AVNRT termination with cryo

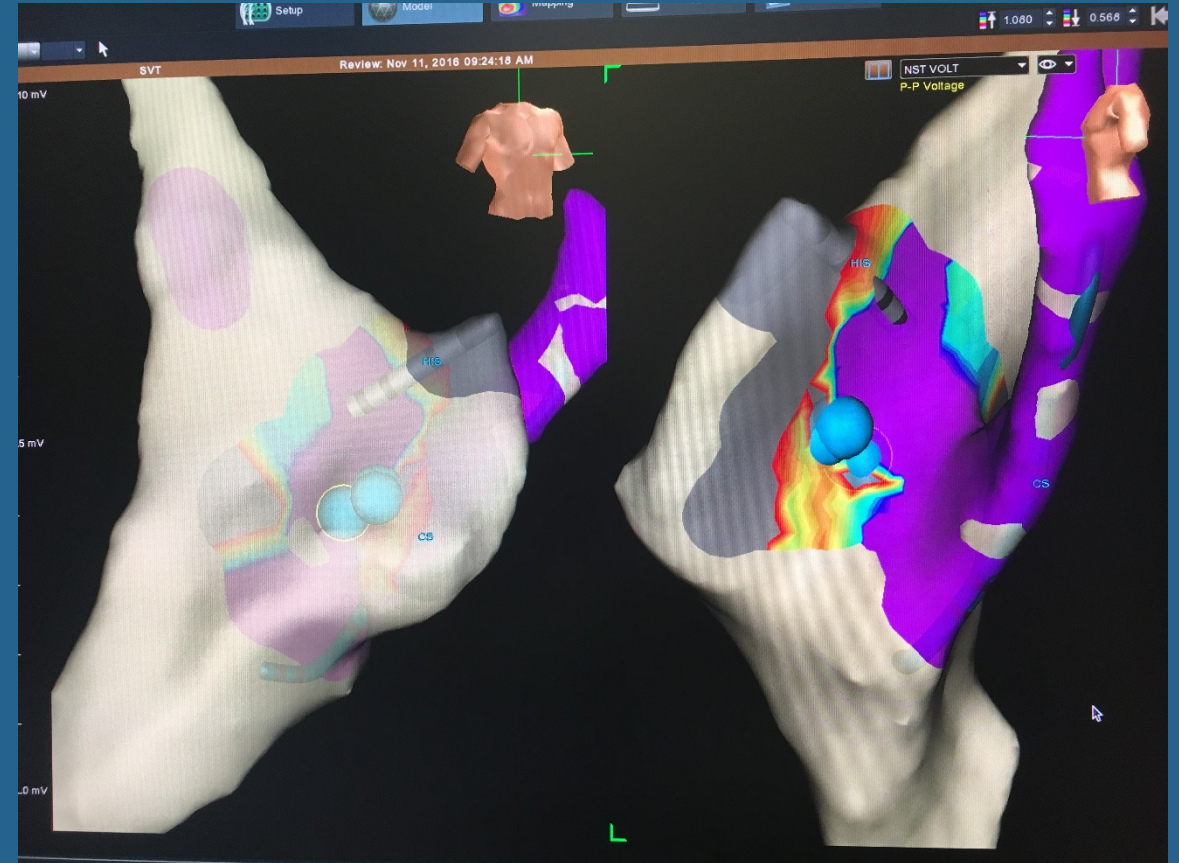
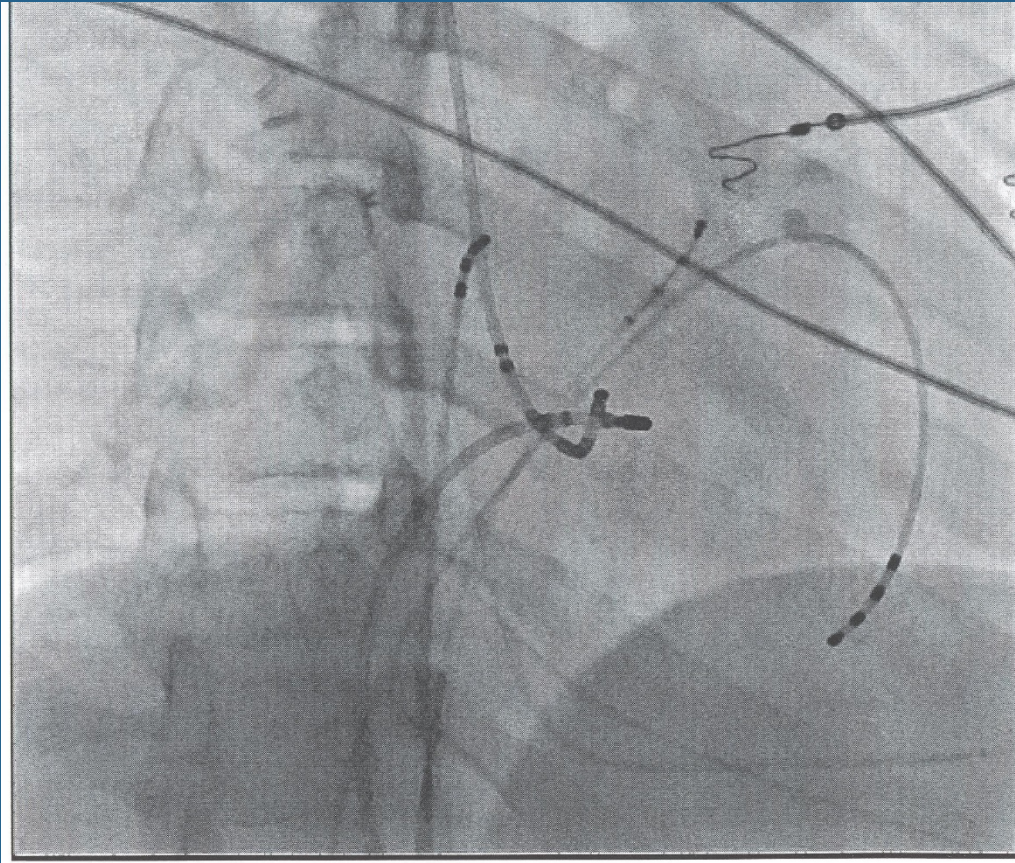


AVNRT throughout childhood

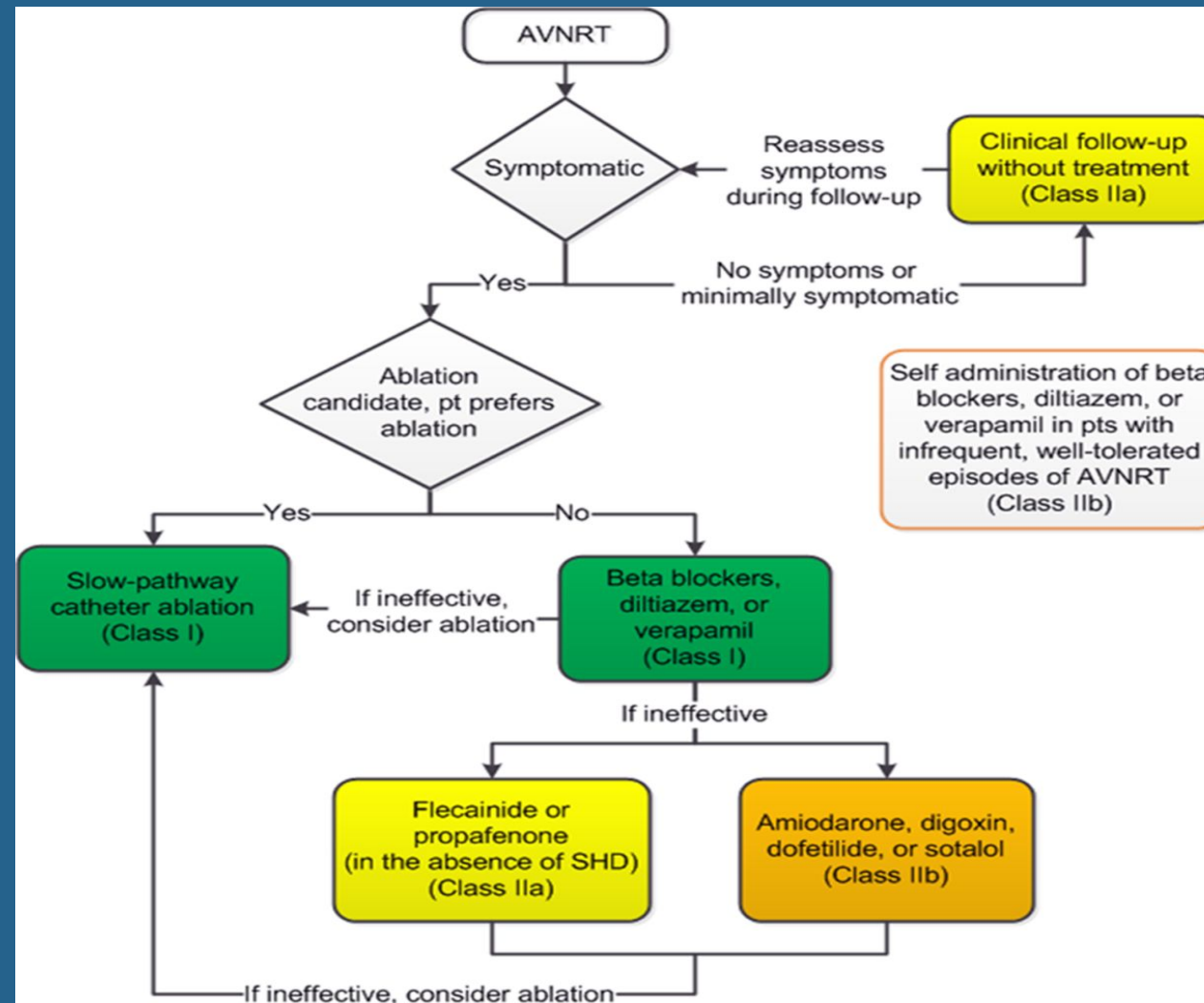
- Infants: 5%
- 1-10 yr: 10-20%
- >10 yr: 40-50%



AVNRT Ablation (Fluoro and NavX)



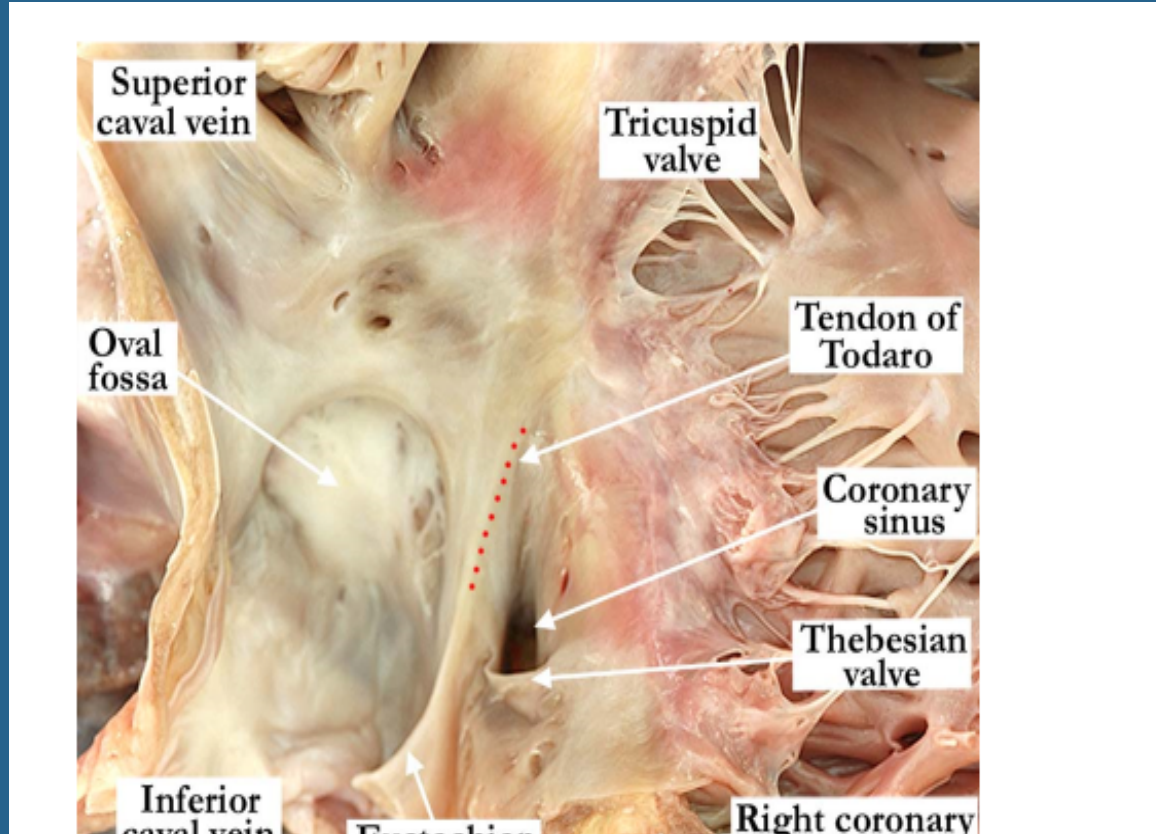
Guidelines for AVNRT management in adults



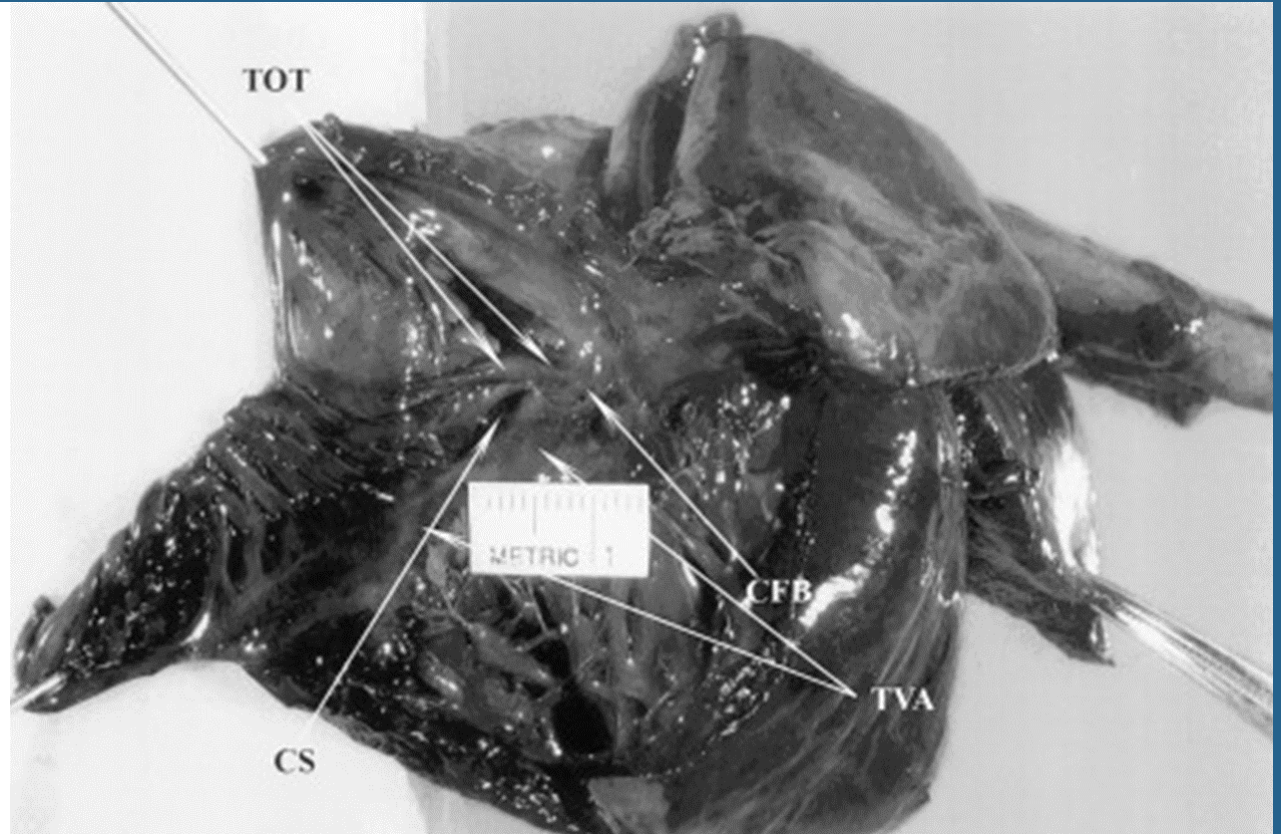
Children are different

- Peripheral vasculature: Access issues
- Size of intracardiac structures
- Triangle of Koch
- Myocardial thickness
- Effects of ablation on immature myocardium
- Distance and size of coronary arteries
- Changes in physiology

Triangle of Koch in older pt

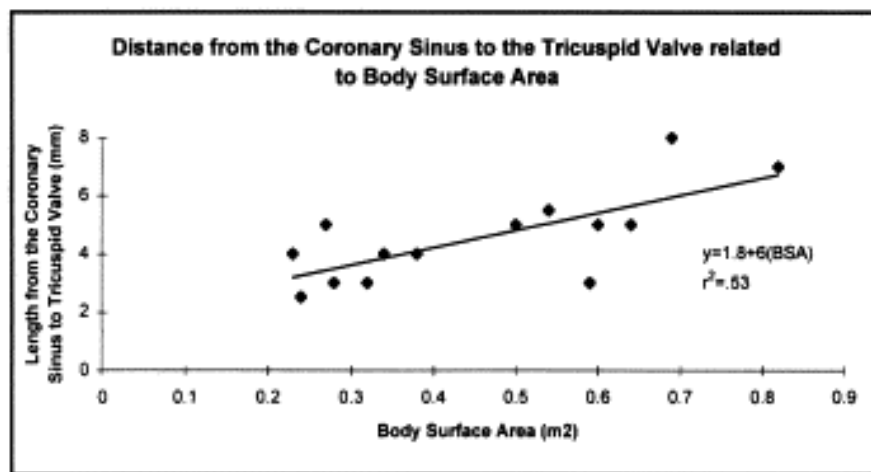


Triangle of Koch in 4.5 kg infant

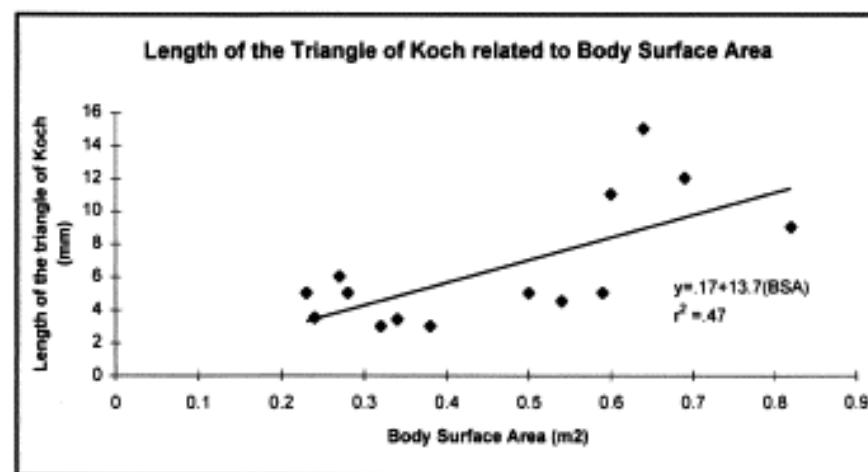


The dimensions of the triangle of Koch in children

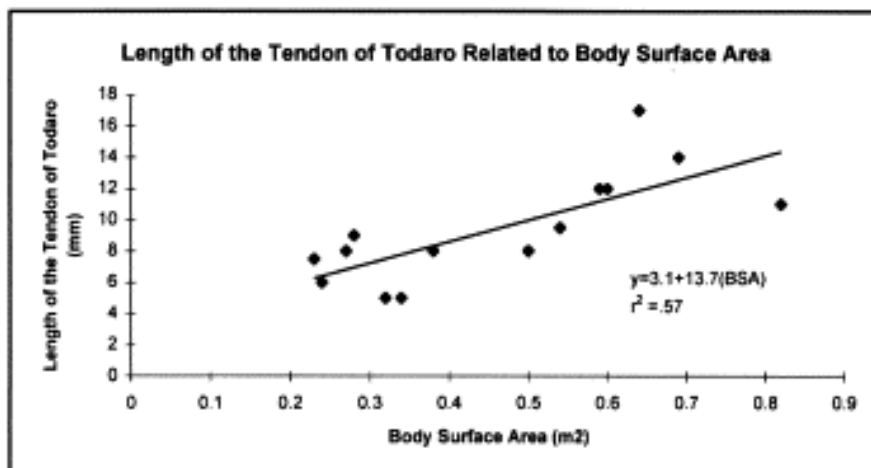
Goldberg...Dick, AJC 1999;83:117–120



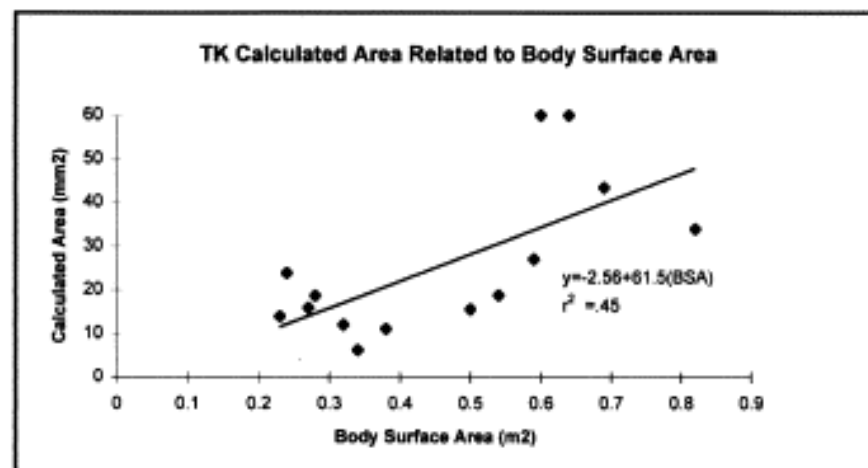
A



B



C



D

The dimensions of the triangle of Koch in children

Goldberg...Dick, AJC 1999;83:117–120

- “The length of the triangle of Koch in subjects $<0.6\text{m}^2$ may be shorter than the 5 to 7 mm diameter of the lesion produced by the standard 4-mm tip radiofrequency ablation catheter. Based on these data, we concur with the report from the Pediatric Electrophysiology Society and recommend the avoidance of the delivery of radiofrequency energy in the area of Koch’s triangle in children $<0.6\text{m}^2$ or 15 kg, unless indicated as a life-saving intervention”

Outcomes of RF and Cryo ablation for AVNRT in children

- **Prospective assessment after pediatric cardiac ablation: demographics, medical profiles, and initial outcomes**
Van Hare GF et al, J Cardiovasc Electrophysiol 2004;15(7):759-70. & Heart Rhythm, 2004 Jul;1(2):188-96.
- AVNRT RF ablation Success 140/142 (99%)
- Recurrence at 1 yr: 4.8%
- Permanent AV Block: 3/142 (2.1%)
- **Cryoablation Therapy for Atrioventricular Nodal Reentrant Tachycardia in Children: A Multicenter Experience of Efficacy**
Das S et al, Pediatr Cardiol 2012, Volume 33(7) pp 1147–1153
- AVNRT Cryo Ablation Success 368/379 (97%)
- Recurrence: 7.3%
- Permanent AV Block: 0%

Risk of AV block 2° to RF ablation

Study	Number of patients	Age of patients	AV block related to RF ablation
Schaffer MS, Circulation 1996 (Pediatric RF Registry)	314	<21 years	1.6%
Van Hare GF, JCE 2004 (Prospective Pediatric RF Ablation study)	142	<16 years	2.1%
Feldman A, PACE 2011	1419	49±17 years	0.07%
Liao JN, AJC 2013	3442	49±17 years	0.3%
Hanninen JM, JCE 2013 (meta-analysis RF vs Cryo)	4551	46 years	0.75%

A Comparison of AV Nodal Reentrant Tachycardia in Young Children and Adolescents

- 272 patients
- 38 young AVNRT pts (7.7 ± 1.5 years) and 202 older (14.9 ± 2.1 years)
- Acute ablation success achieved in all
- RF ablation primary ablation modality with cryoablation used in 10 patients (three young and seven older)
- Recurrences: 0 in young and 3 in older patients
- One older AVNRT patient (0.5%) required a pacemaker for heart block
- No complications in the young patients

Reddy CD, Silka MJ, Bar-Cohen Y, PACE. 2015;38:1325-32

Cryoablation of AVNRT in children and adolescents: early intervention leads to a better outcome

- 202 consecutive patients (mean age 11.5 years; range: 4-20 years)
- Group A <12 years (n = 101) and group B ≥12 years (n = 101)
- 217 Ablations: 106 (49%) in group A and 111 (51%) in group B
- AVNRT recurrence in group A < group B (4.95% vs 16.8%, P = 0.000)
- No permanent cryoablation-related complications

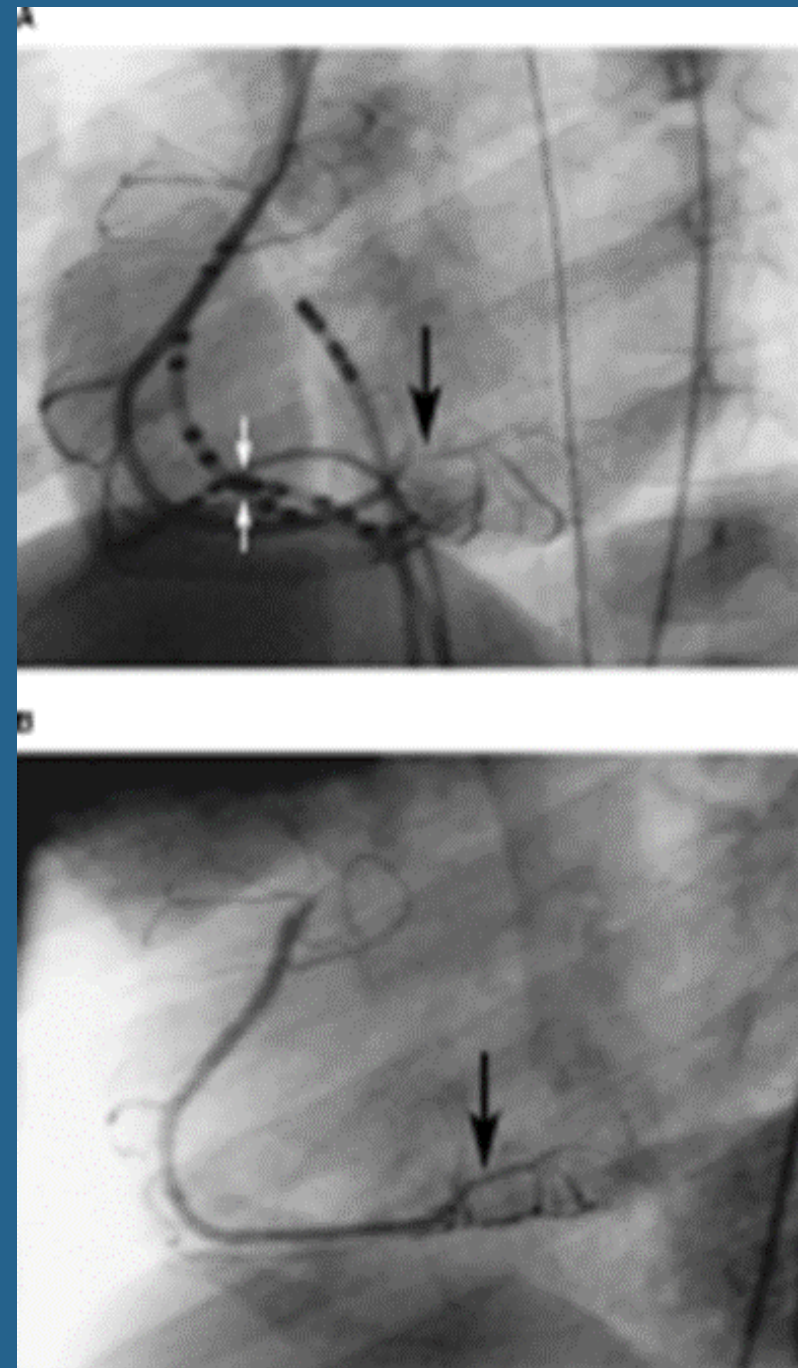
Drago F et al, J Cardiovasc Electrophysiol. 2014 Apr;25(4):398-403

Catheter ablation of pediatric AV nodal reentrant tachycardia: results in small children

- 253 patients, median age 12.5 years; median weight was 48.7 kg.
- 25 (9.9 %) children with body weight ≤ 25 kg
- CHD present in 6 patients (2.4 %)
- RF success: 98 %
- Cryo success: 100 %
- Body weight ≤ 25 kg, success in 96 %
- Major complications significantly higher ≤ 25 kg (12% vs. 2.2 %, $p = 0.04$).
- Permanent AV block after RF in 2 patients with CHD and one infant 8.7 kg
- No difference in success between smaller and larger patients

Krause U, Clin Res Cardiol 2015 Nov;104(11):990-7

Blaufox AD, Saul JP. Acute coronary artery stenosis during slow pathway ablation for AVNRT in a child. JCE 2004;15:97-100

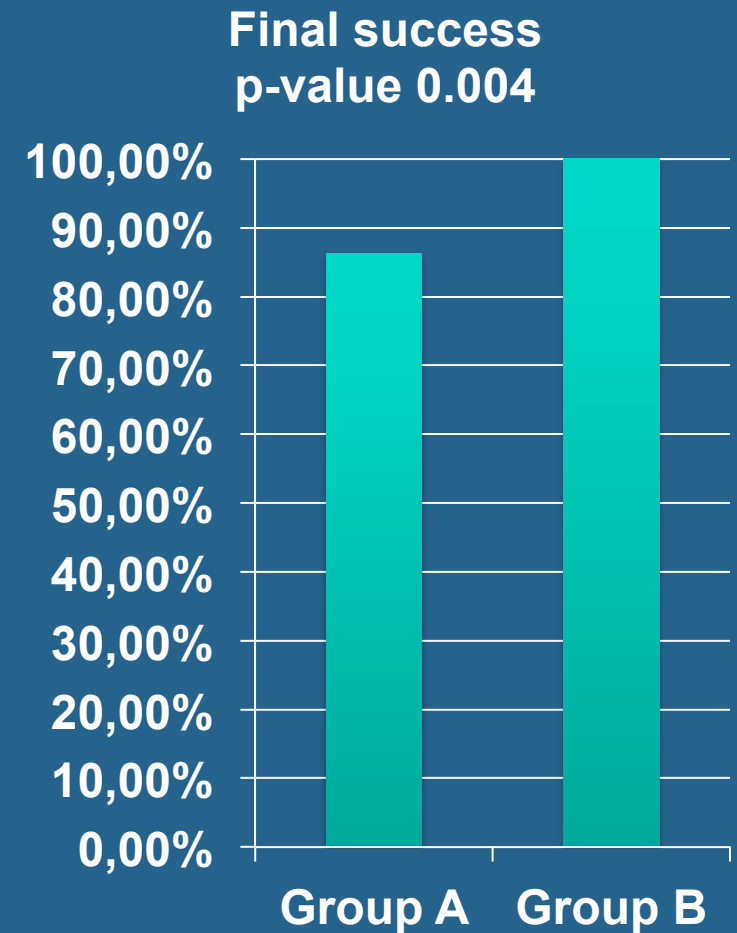
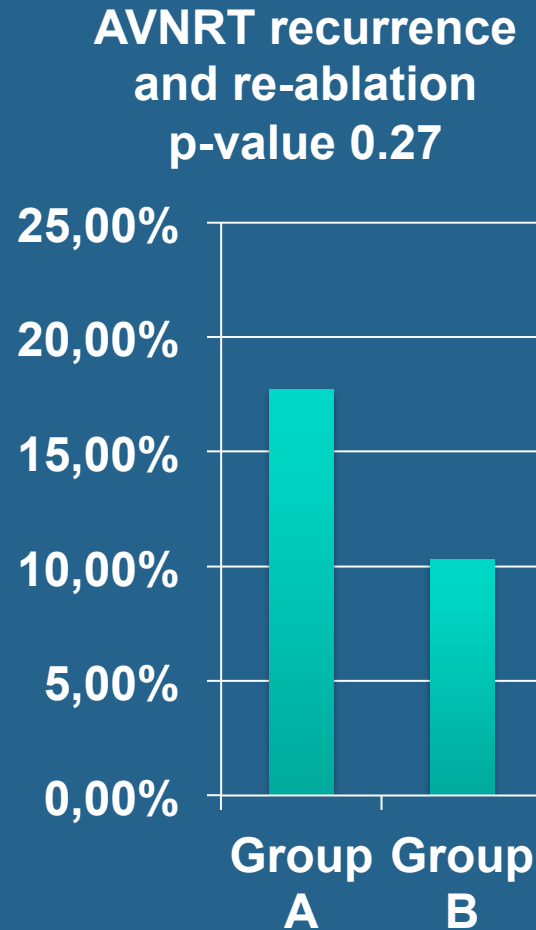
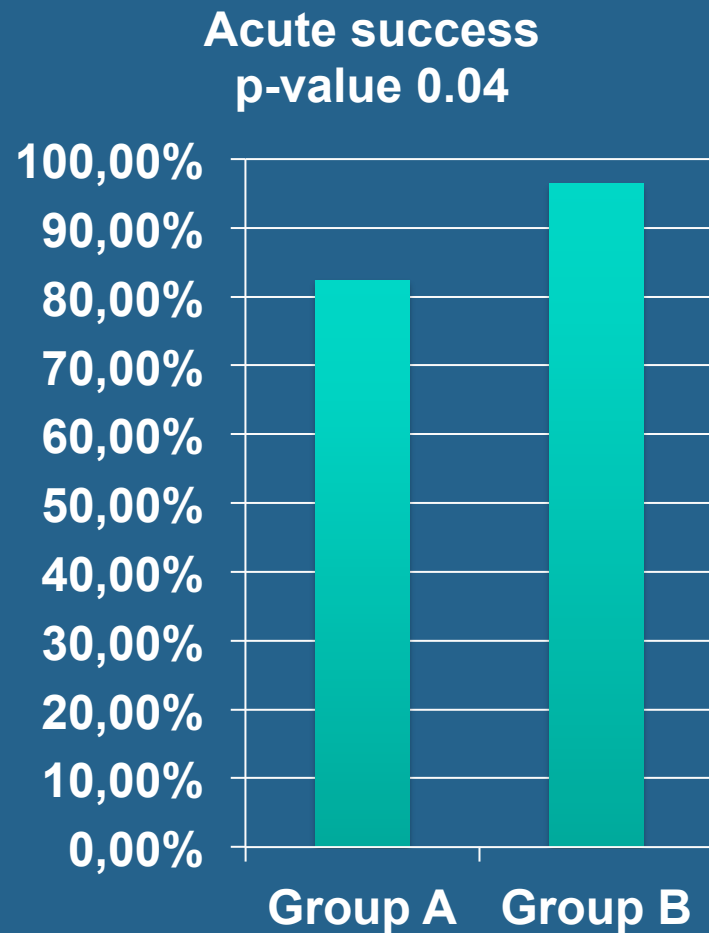


Incidence of coronary artery injury immediately after catheter ablation for supraventricular tachycardias in infants and children

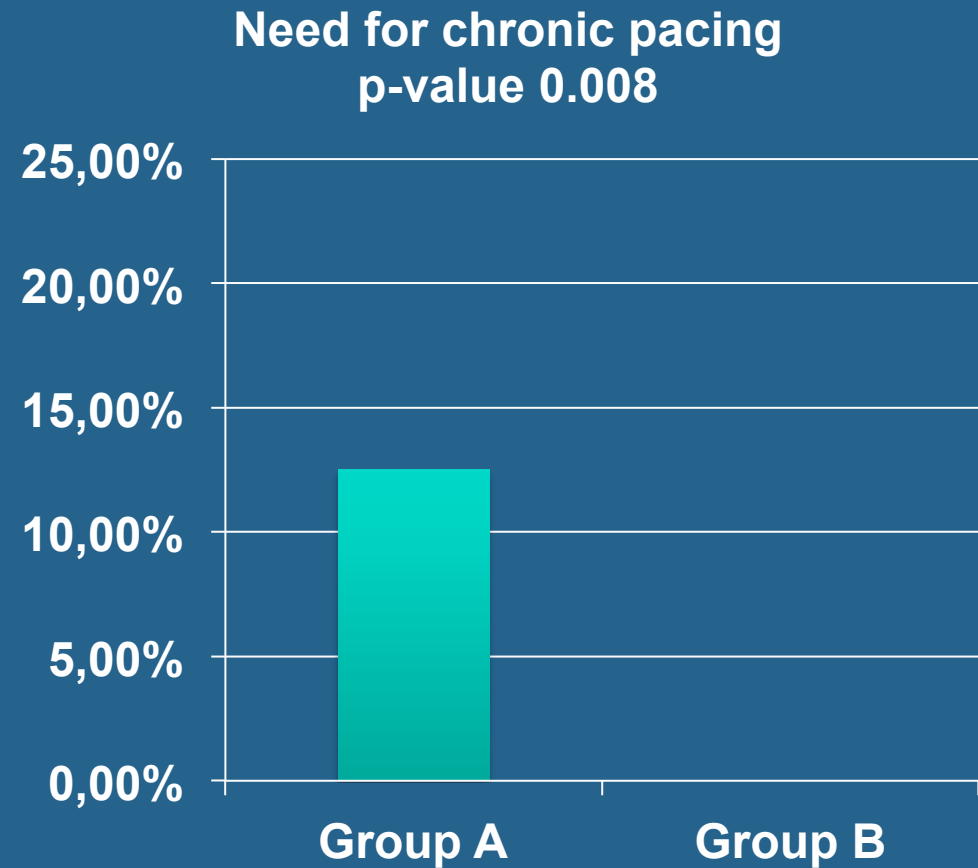
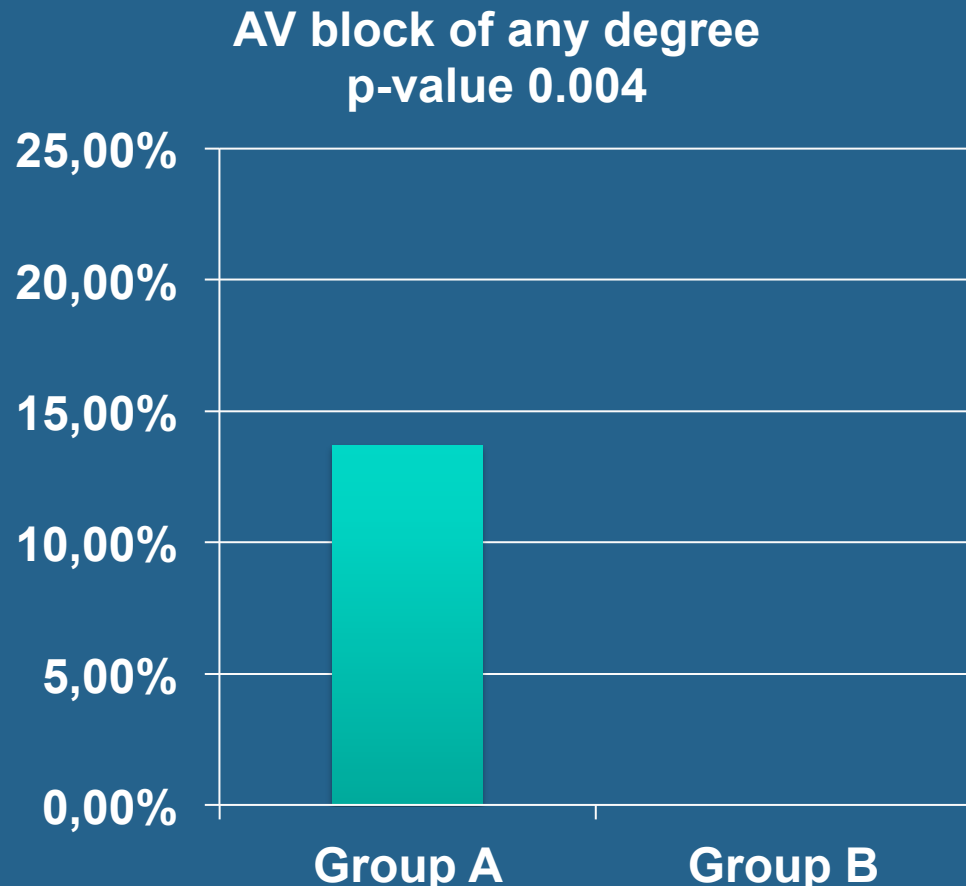
- **212 patients, <21 years with SVT with selective coronary angiography before and 30 minutes after RFA or cryoablation**
- In 2 of 117 with RFA for AP, acute coronary artery stenosis
- **No coronary artery damage after ablation for AVNRT or after cryo**

Schneider HE, Heart Rhythm. 2009;6(4):461-7

Outcome after catheter ablation for AVNRT in CHD



AV block after AVNRT Ablation in CHD



Guidelines for ablation in Children

Saul et al, PACES/HRS Expert consensus 2016

OLDER PATIENTS (>4 YEARS OF AGE OR >15 KG)

- Recurrent or persistent tachycardia with ventricular dysfunction
- Recurrence of tachycardia despite medical therapy (beta blockers or calcium channel blockers)
- Intolerance of medical therapy
- Patient or parent choice to avoid chronic medications
- Acute hemodynamic compromise or need of cardioversion

Guidelines for ablation in Children

Saul et al, PACES/HRS Expert consensus 2016

SMALLER CHILDREN (<4 YEARS OF AGE OR <15 KG)

- Recurrence of tachycardia despite medical therapy (including class I, II and III medications)
- Intolerance of medical therapy
- Impending cardiac surgery when vascular access or intracardiac anatomy will be significantly altered, or postoperative management will be complicated by SVT
- Cryoablation should be strongly considered
- Coronary angiography should be considered if RF necessary

Thank you for coming to Thessaloniki

