

Cryoablation in AVNRT: Current methods and results

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Presenter disclosures

- Financial (Relationships with industry)
 - None
- Off-label, experimental or investigational use of drugs or devices:
 - Historical only

Why cryoablation in AVNRT?

- AVNRT posterior AV node modification by RF (PAPCA data)
 - Acute success rate 97-99%
 - Recurrence rate 4.8% at 12 months
 - Risk of AV block 2.1%
- Cryoablation likely to have a lower (0%) AV block rate

Limitations of Radiofrequency Ablation

- Inability to “heat map”
- Energy delivery may be limited by lack of adequate tip cooling
- Ability to make a lesion dependent on adequate catheter contact in beating heart
- Ablation during SVT is unpredictable
- RF ablation is painful for patient and stressful for cardiologist

Advantages of cryoablation

- Reversible lesions
 - “Ice mapping”
 - Avoidance of permanent AV block
 - Coronary artery issues
- Cryoadhesion
 - Ablation during isoproterenol
 - Ablation during SVT

UCSF Pediatrics

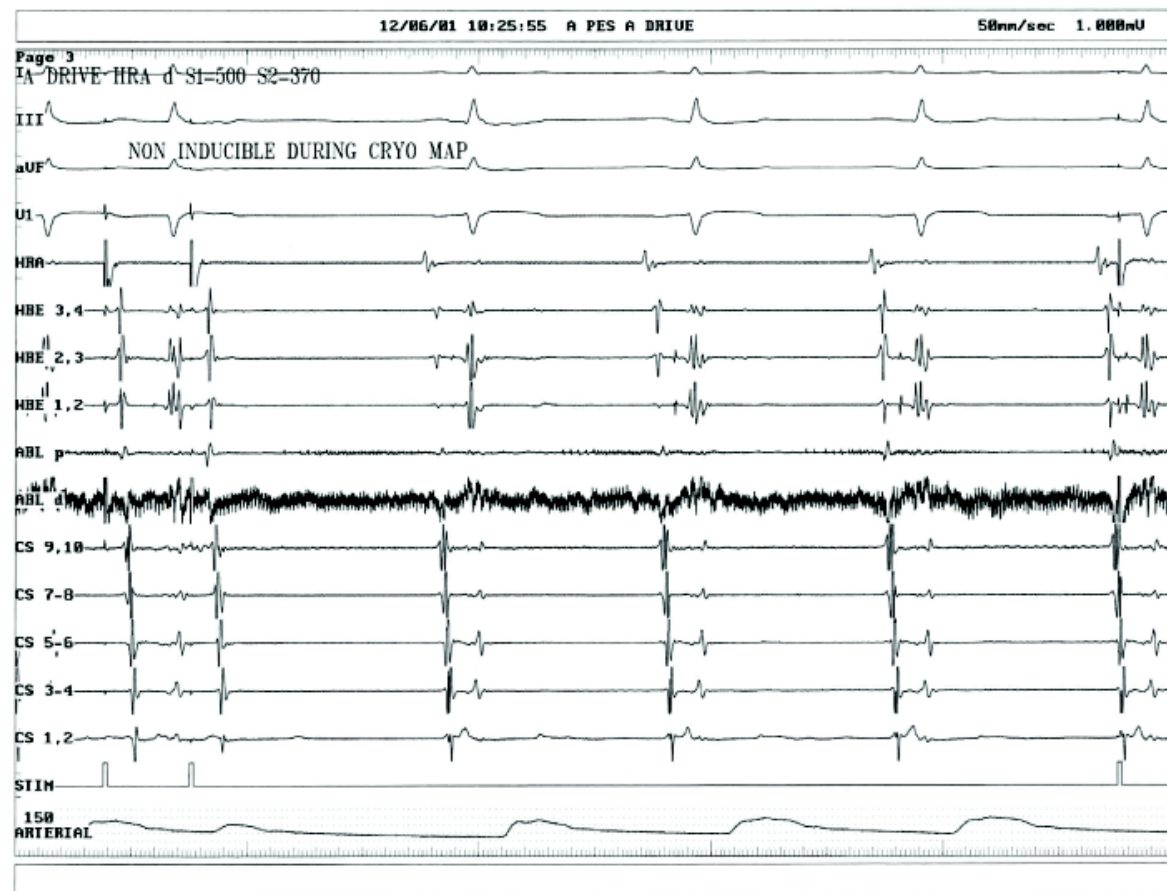
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Use in areas of low blood flow



AVNRT becomes non-inducible during S1S2 testing during cryomapping

Transvenous Cryoablation of the Bundle of His

PAUL C. GILLETTE, M. MICHAEL SWINDLE, ROBERT P. THOMPSON, and CHRISTOPHER L. CASE (with technical assistance of JOE ARMENIA, MARK HAROLD, and CHARLENE KERR)

GILLETTE, P.C., ET AL.: Transvenous Cryoablation of the Bundle of His. Cardiac dysrhythmias are a prominent cause of morbidity and mortality. Pharmacological treatment is ineffective in a large number of patients and is associated with many serious side effects. Thus, direct treatment of cardiac arrhythmias has been used with increasing frequency. Each form of direct treatment, such as surgical ablation, DC catheter ablation, radiofrequency catheter ablation, laser catheter ablation suffer serious drawbacks. Thus, we investigated the utility of transvenous catheter cryoablation of the bundle of His in five miniature swine, 40–60 lbs. in weight. Complete atrioventricular block was produced in each animal during cryothermia and persisted for 1 hour of observation in four out of five swine. In the fifth animal, 2:1 atrioventricular block within the atrioventricular node persisted for 1 hour of observation. Morphological and histologic examination revealed no dysfunction of capillaries and myofibriles in the atrioventricular node and proximal bundle of His. This potential mode of transcatheter therapy deserves further investigation. (PACE, Vol. 14, April, Part I 1991)

Transcatheter Cryoablation of Tachyarrhythmias in Children

Initial Experience From an International Registry

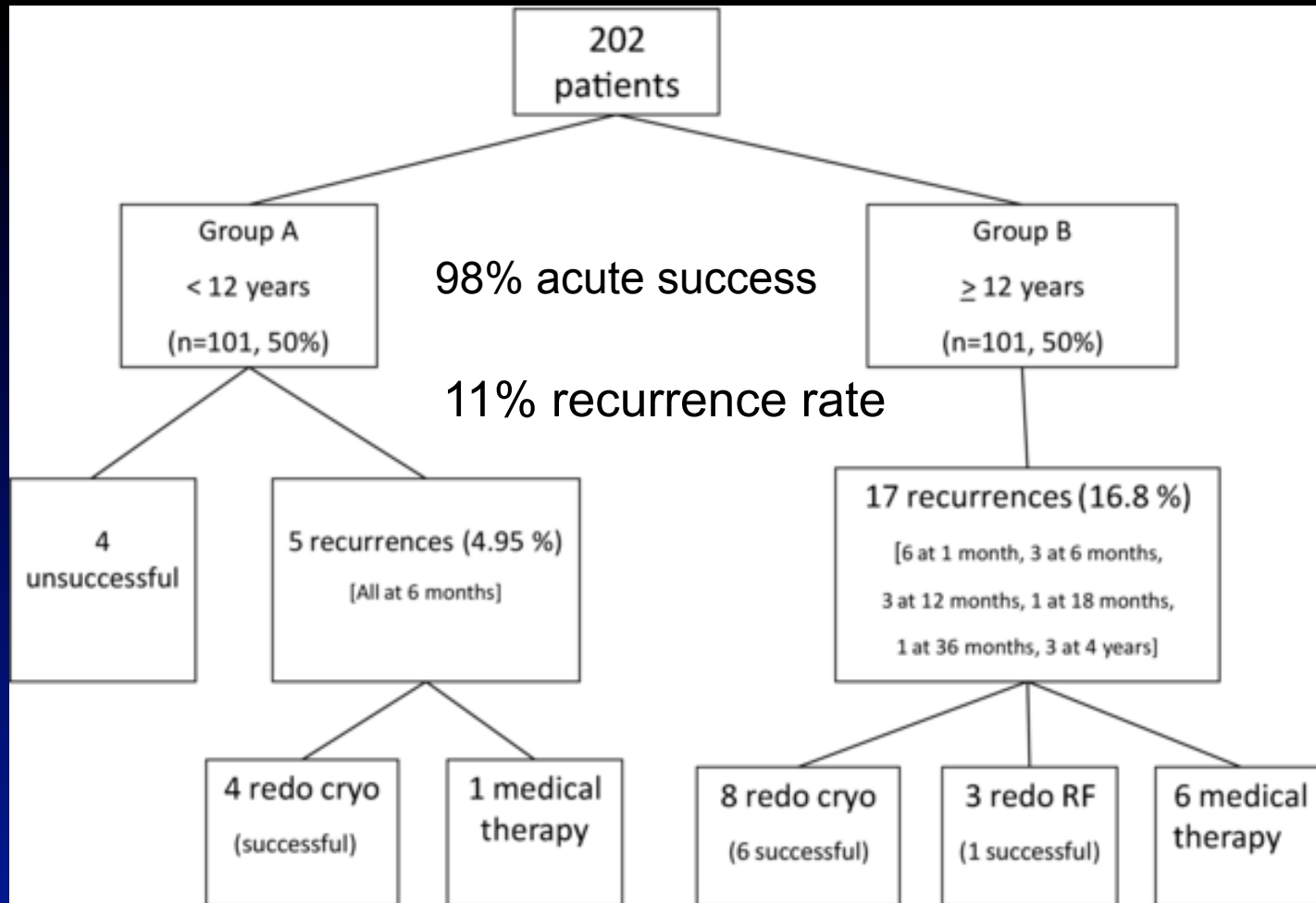
Joel A. Kirsh, MD, FRCP(C), FACC,* Gil J. Gross, MD, FRCP(C), FACC,* Stephen O'Connor, PhD,†
Robert M. Hamilton, MD, FRCP(C),* for the Cryocath International Patient Registry

Ontario and Quebec, Canada

- 14 centers reporting 30 AVNRT cases
 - Canada, Germany, Netherlands, France, USA, Sweden, Italy, Greece
- 83% success, 8% recurrence rate

Cryoablation for AVNRT in children and adolescents

- 202 consecutive patients, age 4-20 yrs over 10 years
 - 101 were <12 years
- General anesthesia: sevoflurane or propafol
- Electrogram guided/anatomic approach
- Utilized cryomapping at -30 degrees
- Recurrence:
 - 4.95% in <12 year group, 16.8% in >12 year group



Conclusion: Young pts do well

Drago et al. JCE 2014

Cryoablation in pediatric AVNRT

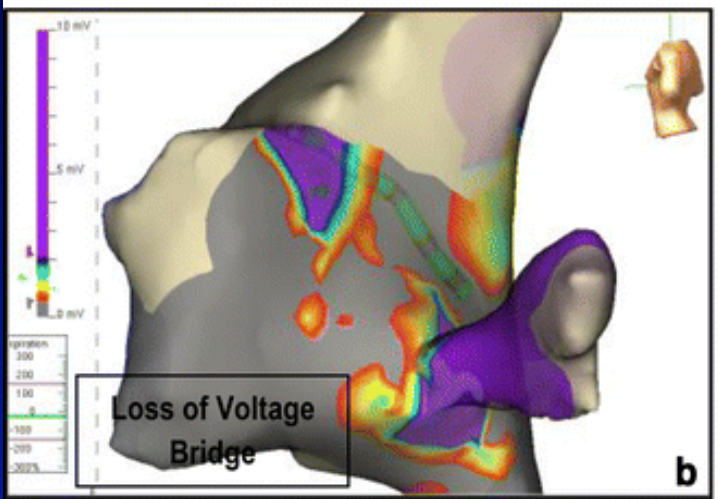
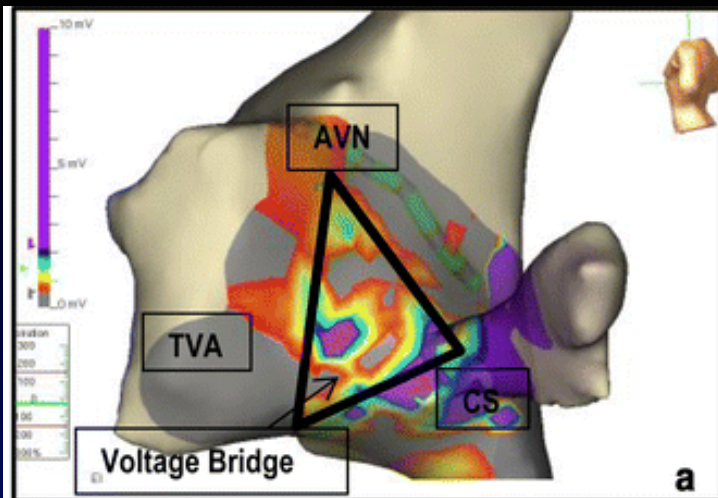
Author, year	Pt #	Success rate	AV block	Recurrence
LaPage 2010	61	96%	0	6.6%
Das 2012	434	97%	0	7.3%*
Qureshi 2013	53	96%	0	2%**
Cokkinakis 2013	70	97%	0	16%
Scaglione 2013	21	100%	0	24%
Kiplapinar 2014	48	96%	0	6%
Malloy 2014	31	100%	0	6.5%
Drago 2014	202	98%	0	11%

*5 US centers

**triple freeze-thaw-freeze

Voltage mapping in AVNRT

- Low voltage “bridge” in slow pathway region
- Thought to represent actual slow pathway
- Successful ablation associated with loss of voltage



Implications of voltage mapping

- Additional anatomic landmark allowing complete avoidance of fluoroscopy
- May substitute for junctional tachycardia seen with RF as marker for slow pathway region
- Theoretically may allow identification of leftward posterior AV nodal extensions

Ice mapping during tachycardia in close proximity to the AV node is safe and offers advantages for transcatheter ablation procedures

Attila KARDOS, Dora PAPRIKA, Tchavdar SHALGANOV, Radu VATASESCU, Csaba FOLDESI, Laszlo KORNYEI, Tamas SZILI-TOROK

Gottsegen Gyorgy Hungarian Institute of Cardiology, Budapest, Hungary.

- “Ice mapping” at -40 C, <80 secs
- Full ablation if termination
- 17 AVNRT patients
 - Fewer cryo lesions with ice mapping
 - Similar success rate (84%) and recurrence rate

Time limited cryomapping

- 1-32 unsuccessful applications, median 8
- 12 patients required just one
- Success in 87/88 (one RF crossover)
- Recurrence in 3.7%
- Requires AVNRT inducibility

Hybrid approach to ablation of AVNRT

- Start with standard RF in usual place, look for JT
- In complicated AVNRT cases that don't respond to standard RF: cryo crossover
 - Sustained AVNRT initiated, +/- isoproterenol
 - Use “test lesions” at -75C for no more than 8 secs
 - If no termination, come off and move
- Possibility of rapidly identifying atypical slow pathway locations

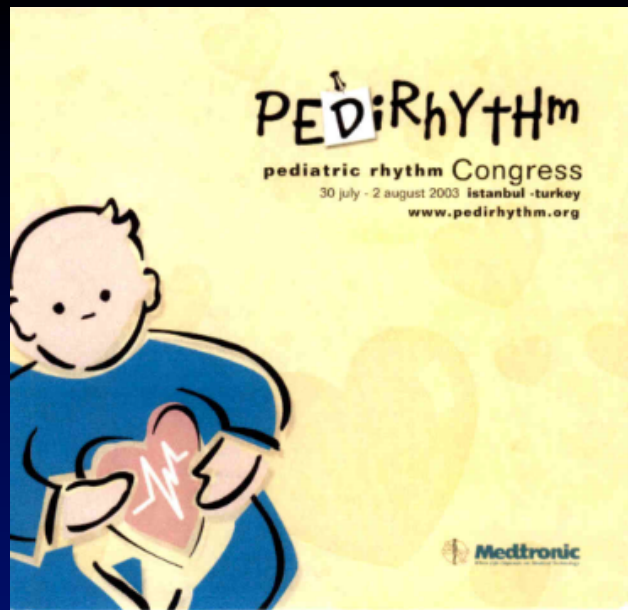


Why not use cryo during AVNRT for all cases?

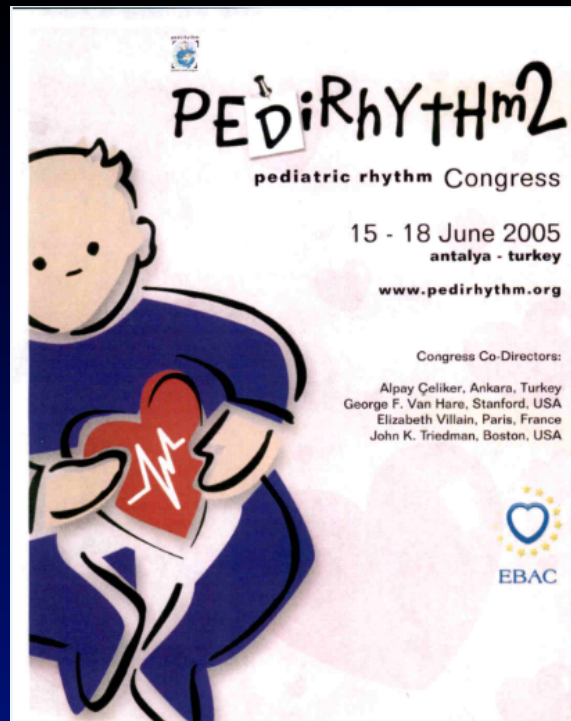
- AVNRT often fast, poorly tolerated under general anesthesia, esp. with isoproterenol
- AVNRT often not easily inducible in baseline
- RF is highly effective with few recurrences
- However, cryo machine is always on and a switch to cryo takes 5 mins

Final thoughts

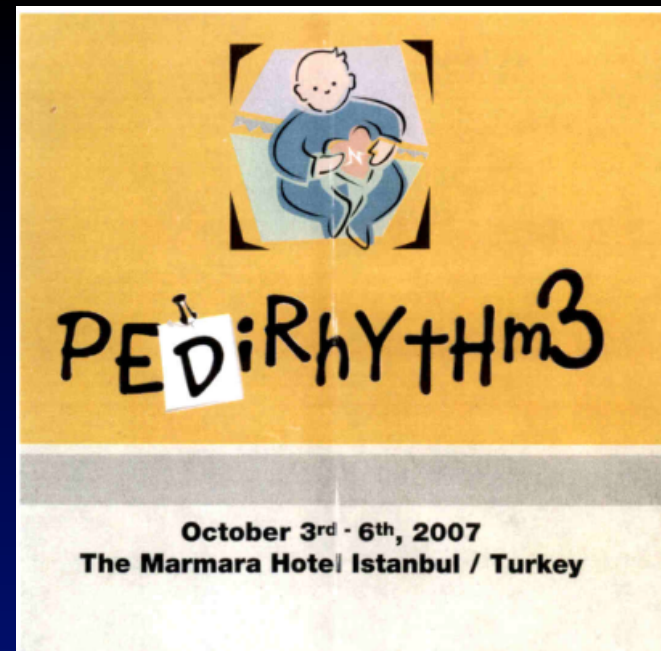
- Cryo is clearly safe with higher recurrence risk, longer procedure times
- Lends itself well to fluoro-free approach
- May provide ability to quickly identify less common anatomy
- All labs should have the capability, even if RF is first-line



Istanbul
2003



Antalya
2005



Istanbul
2007