Is there a Place for Radiofrequency Energy for AVNRT Ablation in Children ?

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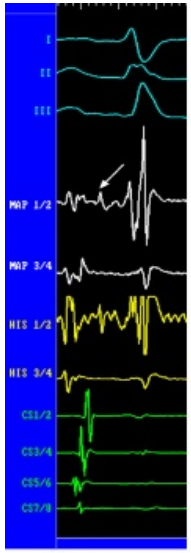
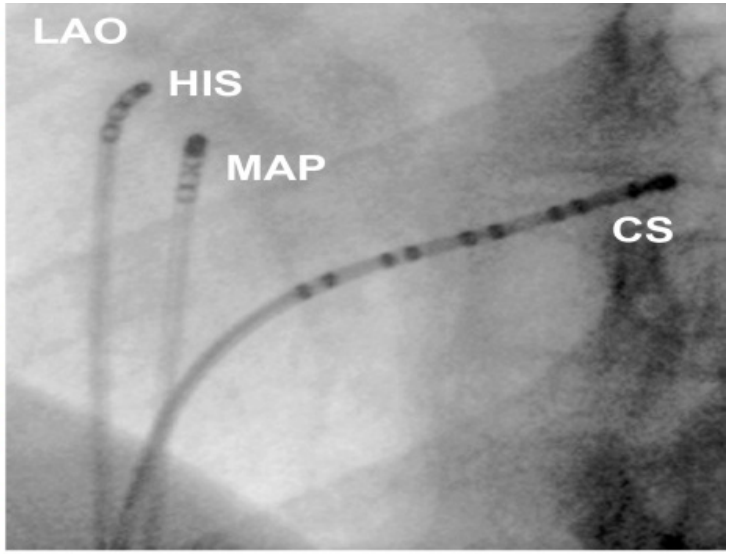
There is a place for RF in AVNRT ablation !

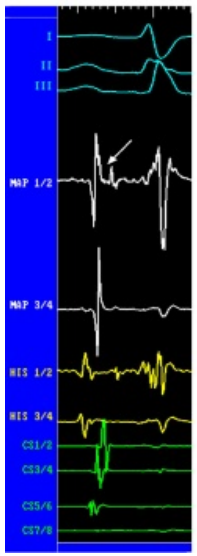
(My story: After using Cyro from 2005-2010, in 2011 I switched back to RF and still like it !)

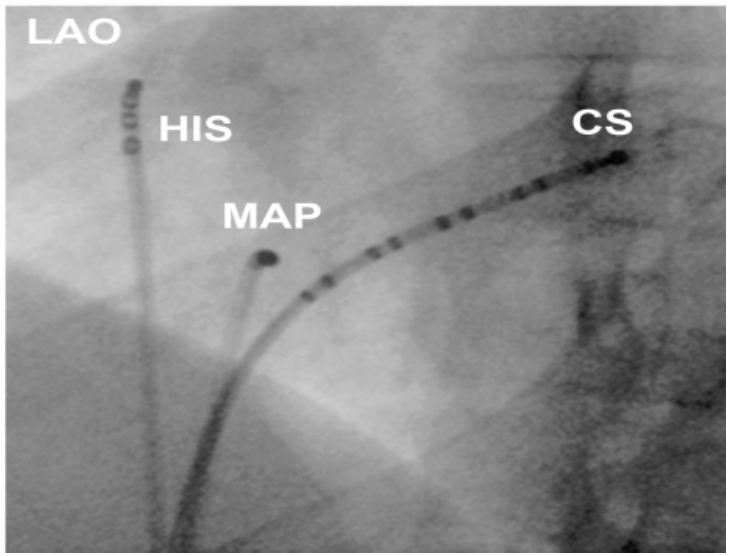
AVNRT Ablation using RF

- RF standard approach in pediatric AVNRT ablation since 1991
- Non-irrigated 7 F ablation catheters
- Temperature of 50^{o} C neccessary to create ible thermal lesion formation
- Anatomical and ECG criteria for ablation site
- Endpoint: Slow pathway ablation or modulation

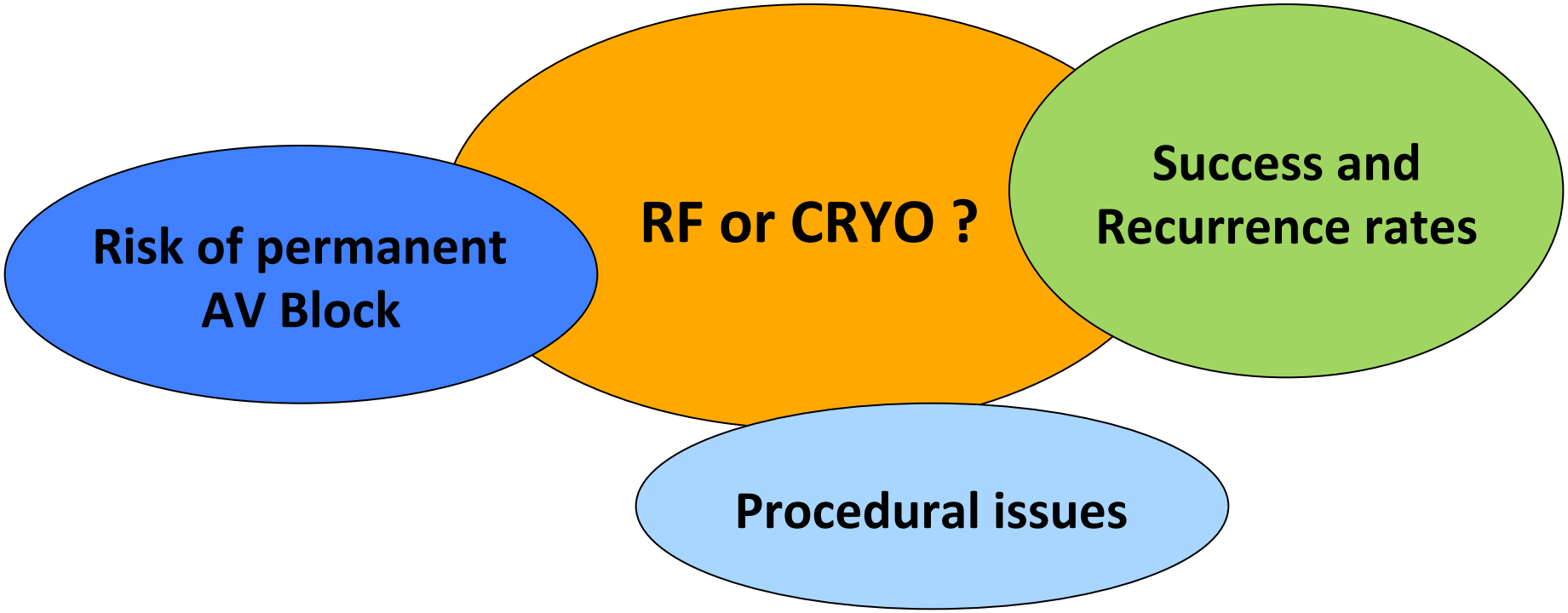








Main issues in AVNRT ablation



There are **no prospective randomized pediatric or adolescent studies** comparing RF vs. Cryo- energy in AVNRT ablation

Issue 1: Risk of permanent AV- Block

RF ablation in AVNRT- the „early years“

Van Hare et al, Ped EP Society, JCE 2004;15(7):759: Prospective cohort 481 patients between 0-16 years with AVRT and AVNRT

- Complications 4.0%; overall risk of **AV-Block 1.2 % (AVNRT 2.1%)**
- **Risk factors for complications: patient age less than 5 years, patient weight <15 kg and center inexperience with the procedure**

Risk of permanent AV- Block

Cryoablation Versus Radiofrequency Energy for the Ablation of Atrioventricular Nodal Reentrant Tachycardia (the CYRANO Study)

Results From a Large Multicenter Prospective Randomized Trial

Isabel Deisenhofer, MD*; Bernhard Zrenner, MD*; Yue-hui Yin, MD; Heinz-Friedrich Pitschner, MD; Malte Kuniss, MD; Georg Großmann, MD; Sascha Stiller, MD; Armin Luik, MD; Christian Veltmann, MD; Julia Frank, MS; Julia Linner, MS; Heidi L. Estner, MD; Andreas Pflaumer, MD; Jinjin Wu, MD; Christian von Bary, MD; Ekrem Ücer, MD; Tilko Reents, MD; Stylianos Tzeis, MD; Stephanie Fichtner, MD; Susanne Kathan; Martin R. Karch, MD; Clemens Jilek, MD; Sonia Ammar, MD; Christof Kolb, MD; Zeng-Chang Liu, MD; Bernhard Haller; Claus Schmitt, MD; Gabriele Hessling, MD

Deisenhofer, Hessling et al Circulation 2010;122:Nov 30;122(22):2239-45

- Largest prospective randomized study in adults (**CYRANO**):
- Multicenter Study; 509 patients with slow pathway cryoablation (n=251) or RF Ablation (n=258)
- **Permanent AV block Cyro 0.0% vs. RF 0.4% (n.s.)**

Are there “high-risk” patients for AVB III ?

- 223 patients with AVNRT; years 2002-2014
- 6 patients with congenital heart disease
- 25 pts (9.9%), body weight < 25 kg; 228 pts > 25 kg
- Major complication rate 12% (< 25 kg) vs.2.2% (>25 kg)

Table 2 Major complications after RF ablation/modulation of the slow pathway observed in 8/253 patients

Age	Body weight (kg)	CHD	Energy source	Complication
13 years	44	Tricuspid atresia, s.p. Fontan	RF	AVB III° after RF, PM
16 years	54	dTGA, s.p. Mustard repair	RF	AVB III° after RF, PM
15 months	8.7	None	RF	AVB III° after RF, PM
6 years	24	None	Cryo	Pericardial tamponade, drainage
9 years	38	None	RF	Pericardial tamponade, drainage
4 years	20	None	RF	Groin vessel injury, surgery
9 years	41	None	RF	Groin vessel injury, surgery
14 years	53	None	RF	Groin vessel injury, surgery

AVB atrioventricular block, *CHD* congenital heart disease, *Cryo* cryoenergy, *dTGA* d-transposition of the great arteries, *PM* pacemaker, *RF*

Consider Cryo for congenital heart disease patients or small children !

Krause et al, Clin Res Cardiol (2015) 104:990–997

Risk of permanent AV- Block
Conclusion

- The risk of AVB III might be influenced by patient selction and operator experience
- The risk seems very low in older children and adolescents with normal anatomy
- The risk seems increased in small children or patients with congenital heart disease

Issue 2 : Success rates and Recurrence

	RF	Cryo
Acute Success rates	**95- 100%**	**83-98%**
Recurrence rates	**0- 10%**	**0- 28%**

From Collins KK et al (PACE 2011; 34:304–308)

Success and recurrence

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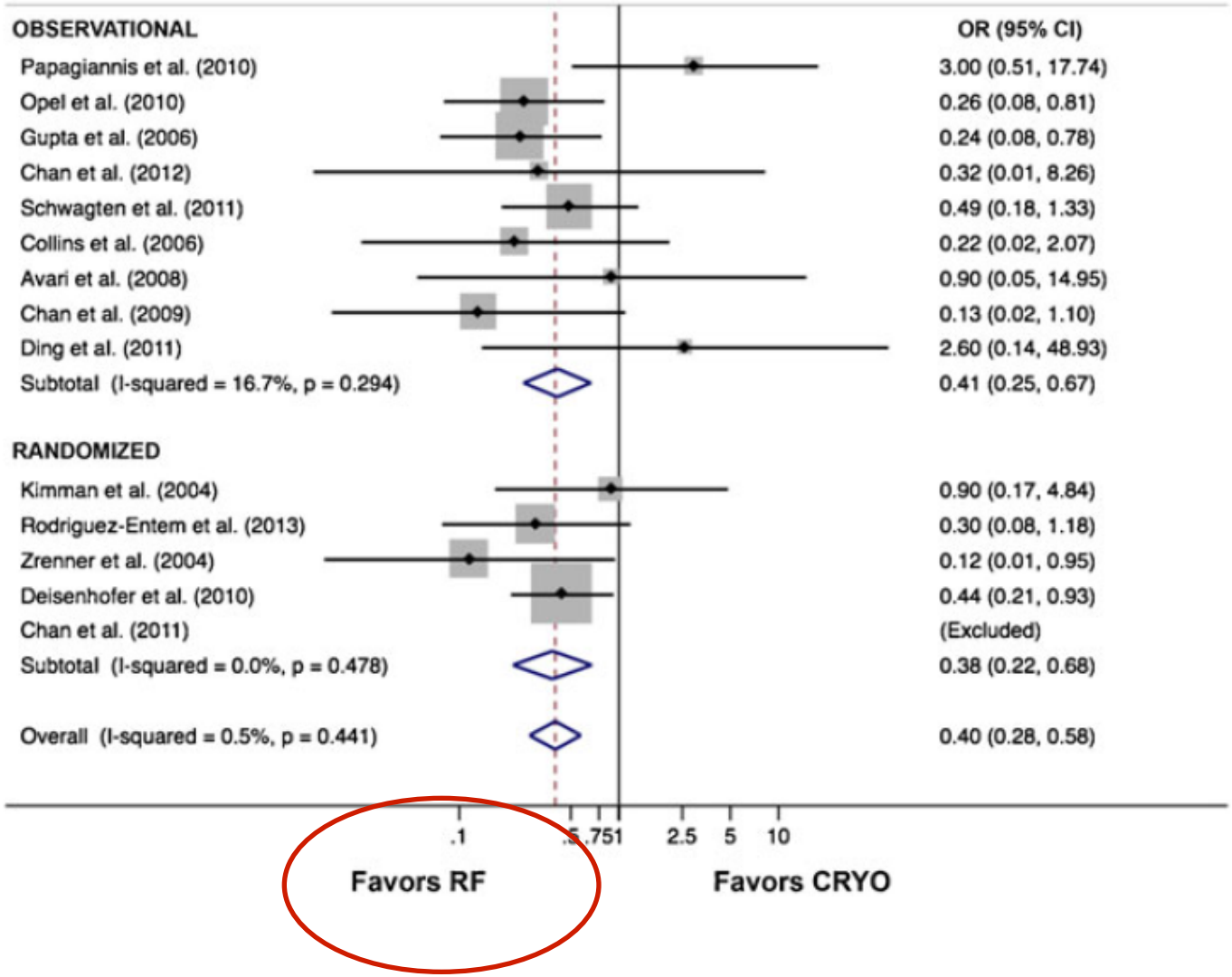
- Largest prospective randomized study in adults (**CYRANO**):
- **Acute success RF 98,4 vs 96,8 Cyro (n.s.)**
- **Recurrence RF 4.4% vs. 9.4% Cyro (p= 0.029)**

Success and recurrence

Metaanalysis of 14 studies comparing RF and Cyro for AVNRT



Santangeli, Natale et al, J Intervent Card Electrophysiol 2014; 39:111

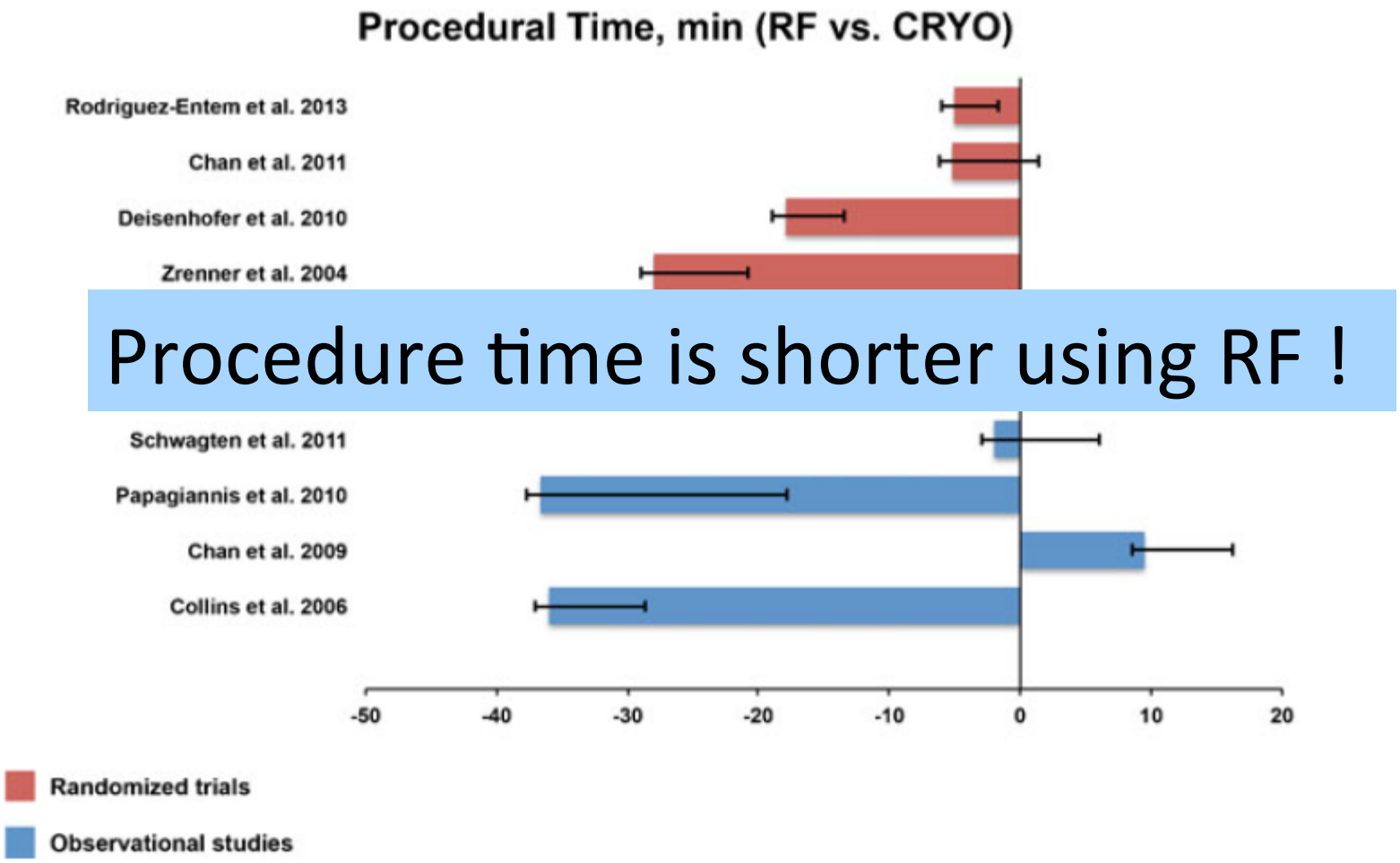
Success rates and Recurrence – own pediatric cohort

- 49 Pts; (mean age 14 ± 2.7 years) with AVNRT and Cryoablation
- Acute success rate 100%
- **Recurrence rate 22,4%** during a follow-up of 30 ± 1.9 months
- No predictors for recurrence; 100% success rate with a second procedure

Reents, Hessling et al (Europace 2012; 14, 1629–1633)

- Recurrence and the longer procedure times were the main reasons we switched back to RF in 2011
- Since then 106 AVNRT ablations in patients with normal anatomy with 3 recurrences and no AV block

Issue 3: Procedural issues



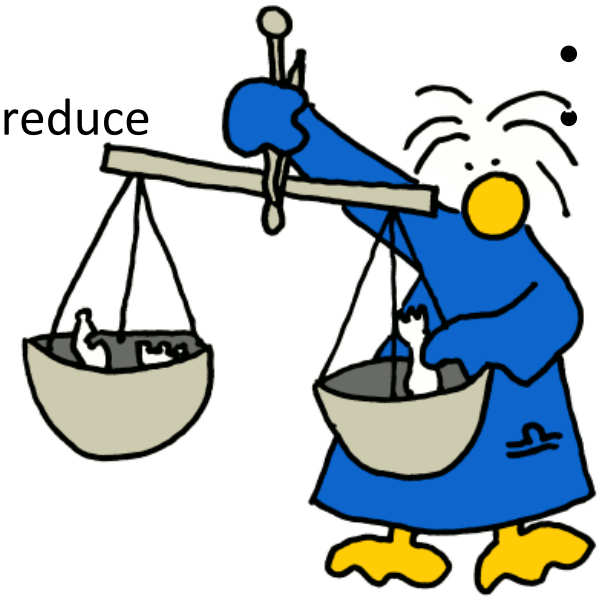
Procedure time is shorter using RF !

Santangeli, Natale et al, J Intervent Card Electrophysiol 2014; 39:111

How much do procedural issues matter ?

RF Ablation

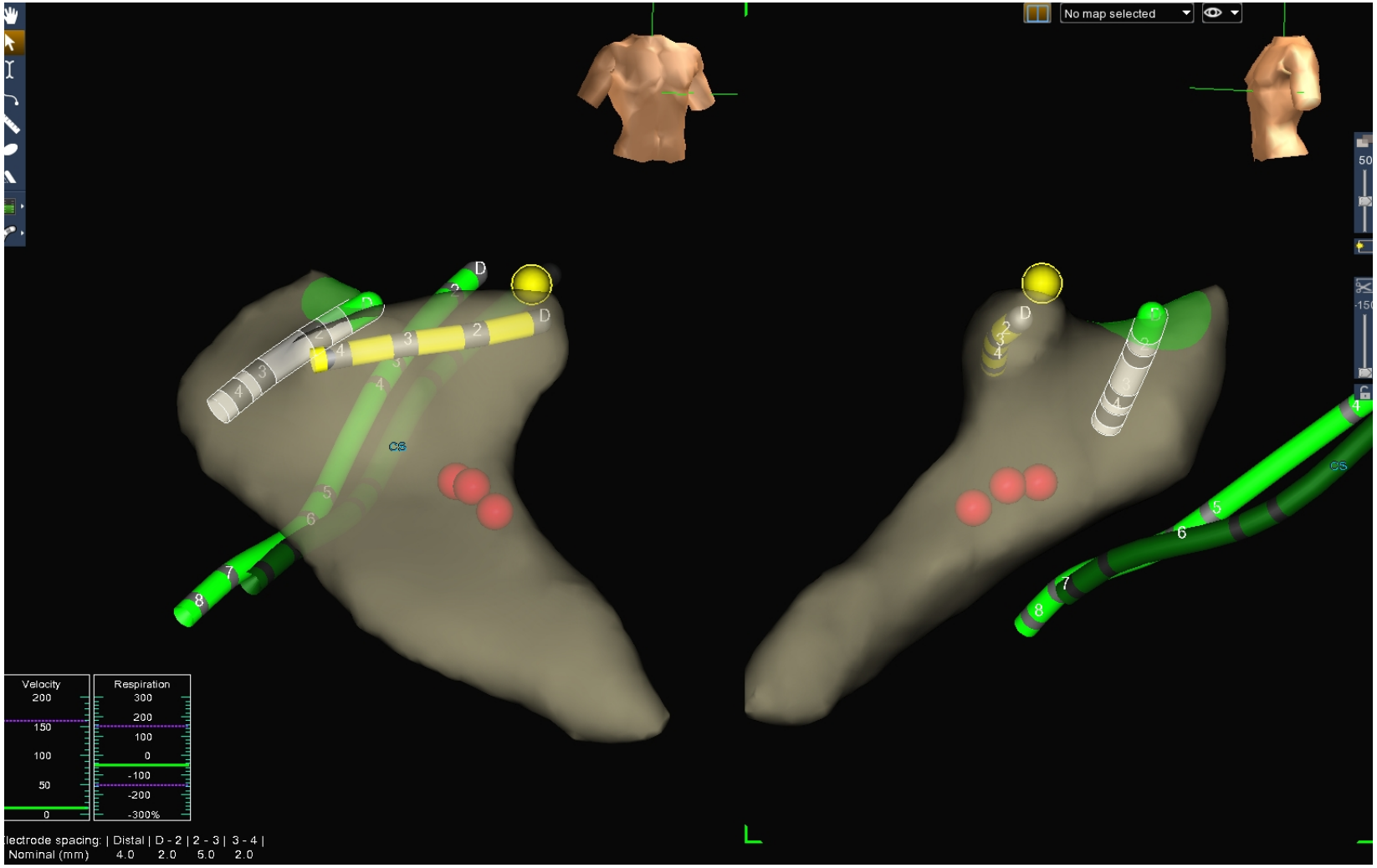
- Standard equipment with a 7 F 4 mm non- irrigated tip catheter, easy to handle
- Standardized approach with a clear endpoint
- Faster procedure times
- (3D mapping system to reduce fluoroscopy)



Cyro Ablation

- Large and stiff catheters
- 6 or 8 mm tip ?
- Duration of cryolesions ?
- Bonus freeze ?
- Local or linear lesions ?
- Longer procedure times
- Endpoint ? Slow PW ablation or modulation ?

3 D Mapping+ RF Ablation in AVNRT



Since 2014, we routinely use a 3 D mapping system in AVNRT ablation

Fluoroscopy times usually between 1-4 min

What do operators like ?

Collins KK et al ; PACE 2011; 34:304–308
Use of Cryoablation for Treatment of Tachyarrhythmias in 2010: Survey of Current Practices of Pediatric Electrophysiologists:

- Cryoablation was utilized for <50% of the ablation volume, and most utilize it for only 10%

- Cryoablation utilized as **first line treatment for all pts with AVNRT by 41% of physicians**, while 16% use cryoablation as first-line treatment for AVNRT only in younger or smaller patients.

Table I.

Survey Responses to Reasons behind Not Choosing Cryoablation for Atrioventricular Nodal Reentrant Tachycardia (AVNRT) or for Accessory Pathways (AP)*

	AVNRT	AP
The recurrence rate for cryoablation is too high	62%	78%
I have never had atrioventricular block with radiofrequency	33%	
I dislike the handling of the cryoablation catheter	29%	60%
Initial success rate for cryoablation is too low	20%	45%
Cryoablation lengthens procedure time too much	20%	27%
I dislike the signals from the cryoablation catheter	2%	5%
I have never been trained or proctored in the use of cryoablation	2%	2%
Other	7%	8%

*Survey responders could check all that apply.

Conclusions

In the older child and adolescent with a normal anatomy, RF ablation in AVNRT

- has a high acute and long-term success rate
- has a very low risk of AV block
- is a standardized approach with a good endpoint
- and an easy- to –use equipment

and therefore still has a place in AVNRT ablation !

Thank you for your attention !