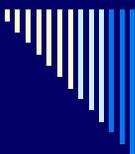
A decorative header for a presentation slide, identical to the one above, featuring a dark blue background, a white horizontal line, and a graphic of vertical bars in the top-left corner.

SAN Ablation
Indication and approach

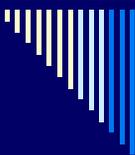
Neama El-Meligy MD

Cardiology Department, Benha University



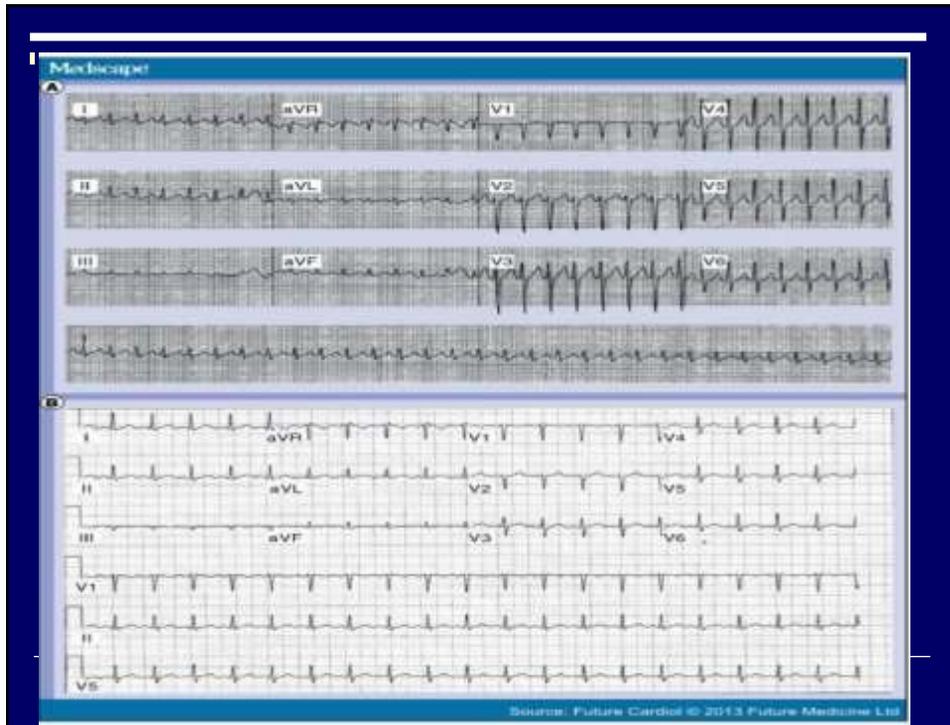
Indication

- SAN ablation reserved for severe refractory cases of **Inappropriate sinus tachycardia (IST)**
- The pathogenesis of IST is multifactorial
 - enhanced SN intrinsic automaticity
 - altered sympathovagal balance
 - B-adrenergic hypersensitivity



Diagnosis of IST

- Exclusion of causes of appropriate ST
(Anemia, Pheochromocytoma, hyperthyroidism, Cardiomyopathy)
- Average daily heart rates in excess of 100 BPM by 24-hour holter
- IST patients also realize little heart rate slowing during sleep
- Do not realize any significant heart rate slowing when they lie down
- On a Bruce protocol treadmill stress test, IST patients usually get their heart rate above 130 within Stage I of the test



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Ablation of Inappropriate Sinus Tachycardia

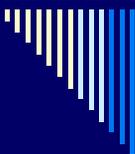
A Systematic Review of the Literature

TABLE 1 Demographic Characteristics of the Study Population

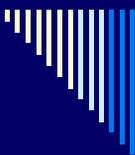
First Author (Ref. #), Year	Population, n	Age, yrs	Female	No. of Failed Drugs ^a	Beta-Blockers	Calcium-Channel Blockers	HR, Baseline ECG, beats/min ^b	HR, 24-h Holter ECG, beats/min ^b
Lee et al. (3), 1995	16	35.4 ± 2.3	15 (94%)	4.2 ± 0.3	16 (100%)	13 (81.2%)	104 ± 18	NA
Collins et al. (5), 1999	10	38 ± 7	9 (90%)	NA	10 (100%)	5 (50%)	NA	NA
Mun et al. (4), 2000	29	37 ± 12	26 (90%)	4.7 ± 2.9	NA	NA	93 ± 9	NA
Marrasche et al. (16), 2002	39	31 ± 5	35 (90%)	NA	33 (84.6%)	NA	99 ± 14	108 ± 5
Boehmene et al. (33), 2003	2	26.5 ± 2.1	2 (100%)	1.5 ± 0.7	2 (100%)	1 (50%)	NA	NA
Takemoto et al. (11), 2011	6	43 ± 3	3 (50%)	1.5 ± 0.5	6 (100%)	2 (33.3%)	NA	93 ± 1
Frankef et al. (18), 2012	33	38.9 ± 11.5	31 (93.9%)	NA	25 (76%)	23 (69.7%)	NA	102.5 ± 19.3
Scobson et al. (17), 2014	5	36.4 ± 4.2	5 (100%)	2.2 ± 1.1	4 (80%)	4 (80%)	119 ± 20	NA
Borra-Correa et al. (34), 2015	13	34.2 ± 7.7	13 (100%)	1.6	12 (92.3%)	5 (38.4%)	104 ± 18	NA
Total	151	35.18 ± 10.02	139 (90.8%)	1.48 ± 2.35	108/124 (87%)	53/85 (62.3%)	101.26 ± 16.37	104.54 ± 13.50

^aValues are n, mean ± SD, n (%), n/N (%).

ECG = electrocardiography; HR = heart rate; NA = nonsuppressible.

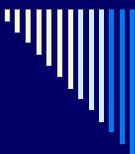


- Acute success rates were consistently high in all studies (88.9%)
- The recurrence was 19.6%

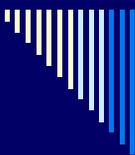


Approach

- Ablation at the site of earliest activation at peak heart rate with the maximum dose of isoproterenol.
- RF was delivered when the atrial signal on the ablation catheter was confirmed to be earlier than the surface P-wave.
- With each change in heart rate or in the P-wave morphology, the site of earliest activation was reassessed, and the new site was targeted.

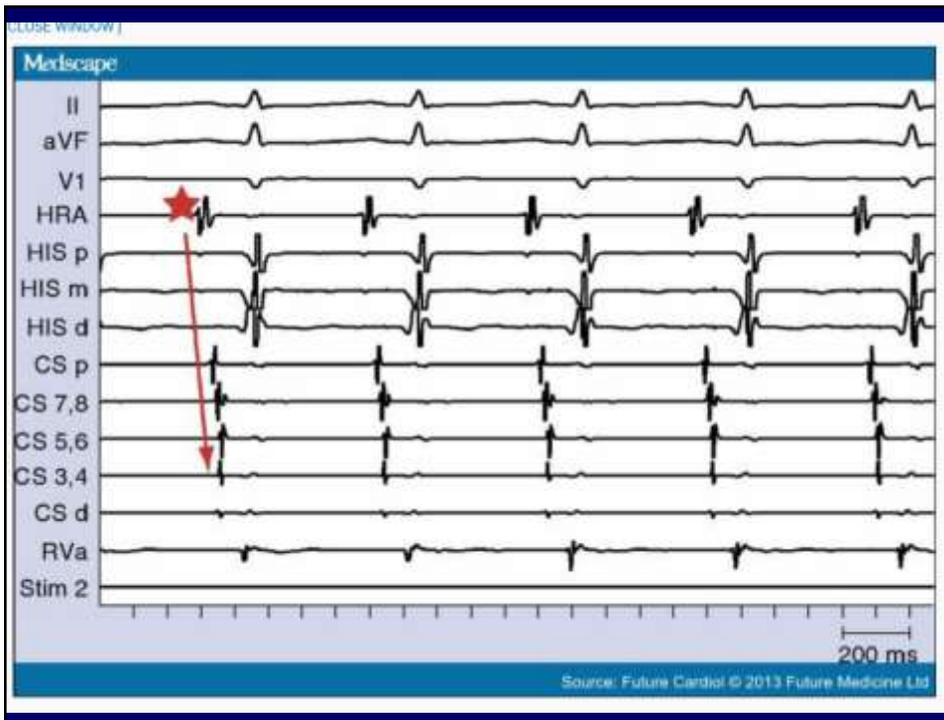


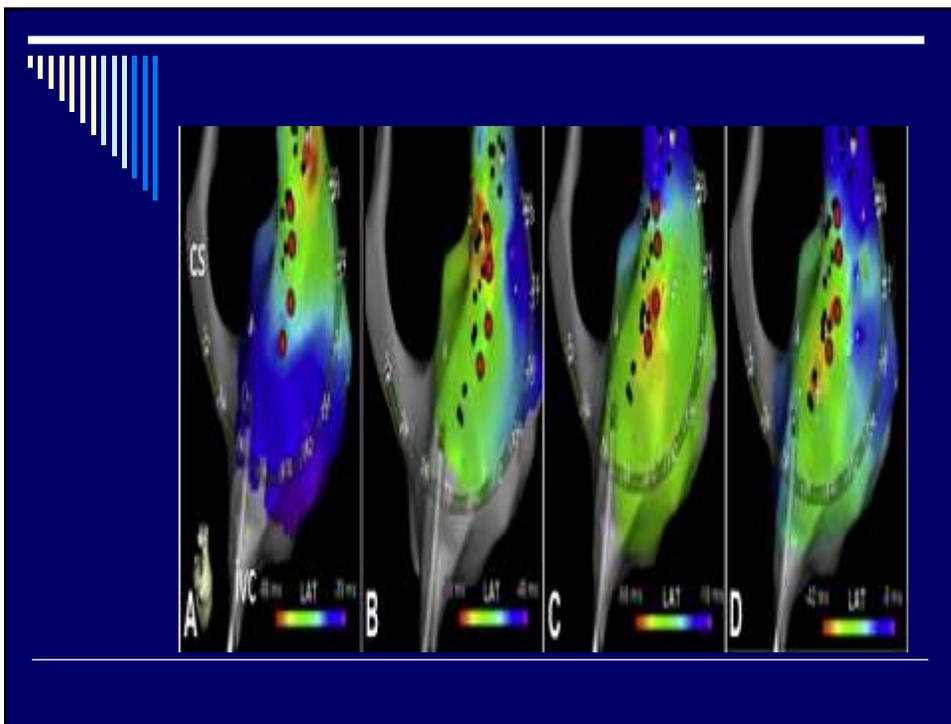
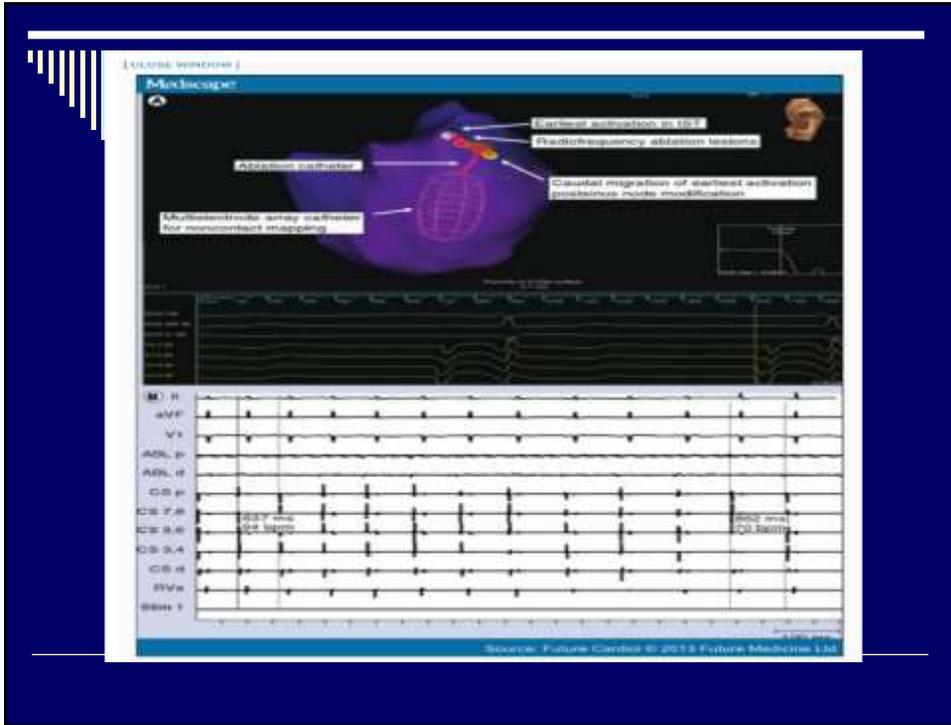
- Ablation is done during isoproterenol infusion aiming for the most active site of the SAN mostly the superior part.
- Anatomical site is at superolateral crista terminalis at the junction of the SVC and RA appendage

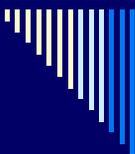


- SAN modification was defined as a minimum 25% reduction in the sinus heart rate under the same conditions of catecholamine infusion, with a shift of P-wave morphology from positive to flat or negative in leads III and Avf
- SAN ablation: a reduction in HR >50% of the tachycardia HR with a junctional escape rhythm

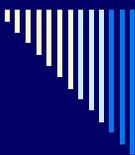
- 3-dimensional nonfluoroscopic mapping system was used in 7 studies
- Noncontact mapping system (EnSite Array multi-electrode catheter)







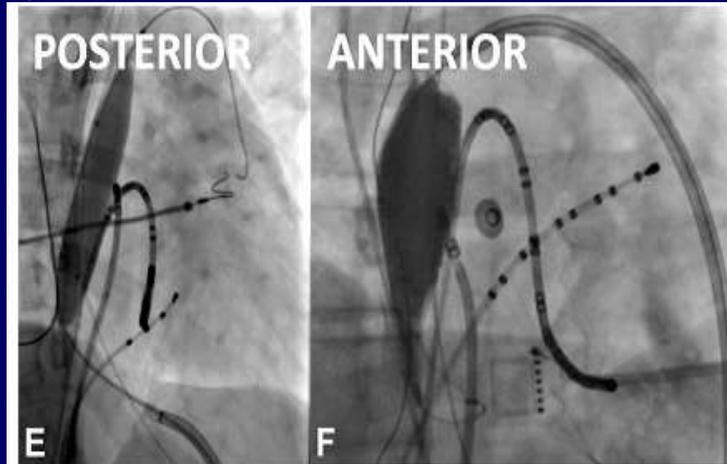
- Complications include:
 - Permanent pacing requirement (9.8%)
 - Right phrenic nerve paralysis(1.3%)
 - Transient superior vena cava (SVC) syndrome(1.3%)



Maneuvers performed to avoid PN injury

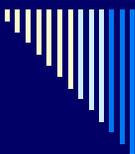
- PN injury is a severe and dreaded complication of IST ablation.
- Pacing from the ablation catheter at a maximum output of 10 mA with pulse width of 2ms to confirm the absence of PN stimulation **before each RF lesion delivery.**
- Epicardial balloon was used for PN protection

Epicardial balloon for phrenic nerve protection.



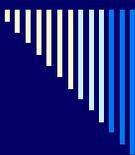
Cryoablation for IST

- With cryoablation, the risk of the irreversibly damaging the phrenic nerve is less
- The site of the tachycardia can be cooled to see what the effect on the sinus node itself before a complete lesion is made
- The incidence of recurrence is higher



CONCLUSIONS

- ❑ SAN ablation reserved for severe refractory cases of IST
- ❑ No evidence to support long-term symptomatic improvement
- ❑ IST ablation/modification achieves acute success in the vast majority of patients with a corresponding high recurrence rate
- ❑ Complications are fairly common and diverse

- 
- ❑ IST ablation is not recommended as a routine intervention by the HRS Expert Consensus Statement on the Diagnosis and Treatment of Inappropriate Sinus Tachycardia(2015)
Class III indication

- ❑ However, the latter document does not sanction the use of IST ablation in highly selected circumstances or as part of research protocols.

