

EVOLUTION OF CARDIAC ELECTROPHYSIOLOGY

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EVOLUTION OF CARDIAC ELECTROPHYSIOLOGY

1960s

- His bundle recording (Scherlag, Damato)
- Programmed electrical stimulation (Durren, Wellens, Coumel)
- Transvenous permanent pacing (Chardack)

1970s

- Antiarrhythmic surgery for SVT and VT
- Anti-tachycardia pacing (Manz)

1980s

- Catheter ablation (Gonzales)
- Radiofrequency current
- Steerable ablation catheters
- Detailed mapping techniques
- ICD (Mirowski)

EVOLUTION OF CARDIAC ELECTROPHYSIOLOGY

1990s

- Catheter ablation of SVT, AF and scar-related VT
- Digital split-screen multichannel recorders
- Customization of mapping and ablation catheters and support sheaths
- Saline-irrigated RF and cryoablation
- Pulmonary vein ablation (Haissaguerre)
- 3-D electroanatomical mapping
- Image integration modalities
- Remote navigation systems

MODERN DEVELOPMENTS IN CARDIAC ELECTROPHYSIOLOGY

Atrial Fibrillation

- New anticoagulants: Dabigatran, Rivaroxaban, Apixiban (less ICH, no dietary restrictions, rapid action, no monitoring)
- Ablation of areas of high dominant frequencies and ganglionated plexi (vagal AF)
- Combined endocardial and epicardial approaches
- Cryoballoons, multipolar catheters, direct visual guidance, laser, basket catheters
- Ablation improves renal function and lower stroke and mortality rates

MODERN DEVELOPMENTS IN CARDIAC ELECTROPHYSIOLOGY

WPW

High risk features in symptomatic patients:

Short AP-RP, multiple, AVRT triggering AF, male sex

Ventricular Tachycardia

Epicardial routes for mapping and ablation

MODERN DEVELOPMENTS IN CARDIAC ELECTROPHYSIOLOGY

Translational Sciences

- AV nodal gene transfer to inhibit overexpression of G protein leading to heart rate control in AF
- Gene therapy to prevent AF with adenovirus containing KCNH2 – G628S gene mutant that inhibits I_{Kr} thus prolonging atrial RP
- Gene transfer to enhance connexin 40, 43 formation thus improving atrial conduction
- Gene manipulation to overexpress SERCA thereby reverse the effects of atrial stretching
- Biological pacemakers via gene transfer using dual HCN2/SkM1 constructs

MODERN DEVELOPMENTS IN CARDIAC ELECTROPHYSIOLOGY

Genetic Arrhythmia Syndromes

- Risk-stratification of LQT syndromes by identifying mutations affecting the transmembrane regions LQT1, LQT3
- Genetic identification of concealed (normal QT) LQT syndromes (benign prognosis)

ICD

- Entirely subcutaneous ICD (S-ICD)
Still lacks ATP, delivers 85J shocks

Pacemakers

- Rate drop DD pacing for +ve ATP test (10s SAB or AVB)

MODERN DEVELOPMENTS IN CARDIAC ELECTROPHYSIOLOGY

CRT

Indices for favorable response:

- Prior hospitalization for heart failure1
- Female sex2
- Non-ischemic cardiomyopathy2
- QRS \geq 150 ms2
- LBBB2
- EDV \geq 125 ml/m²2
- LAV > 40 ml/m²3

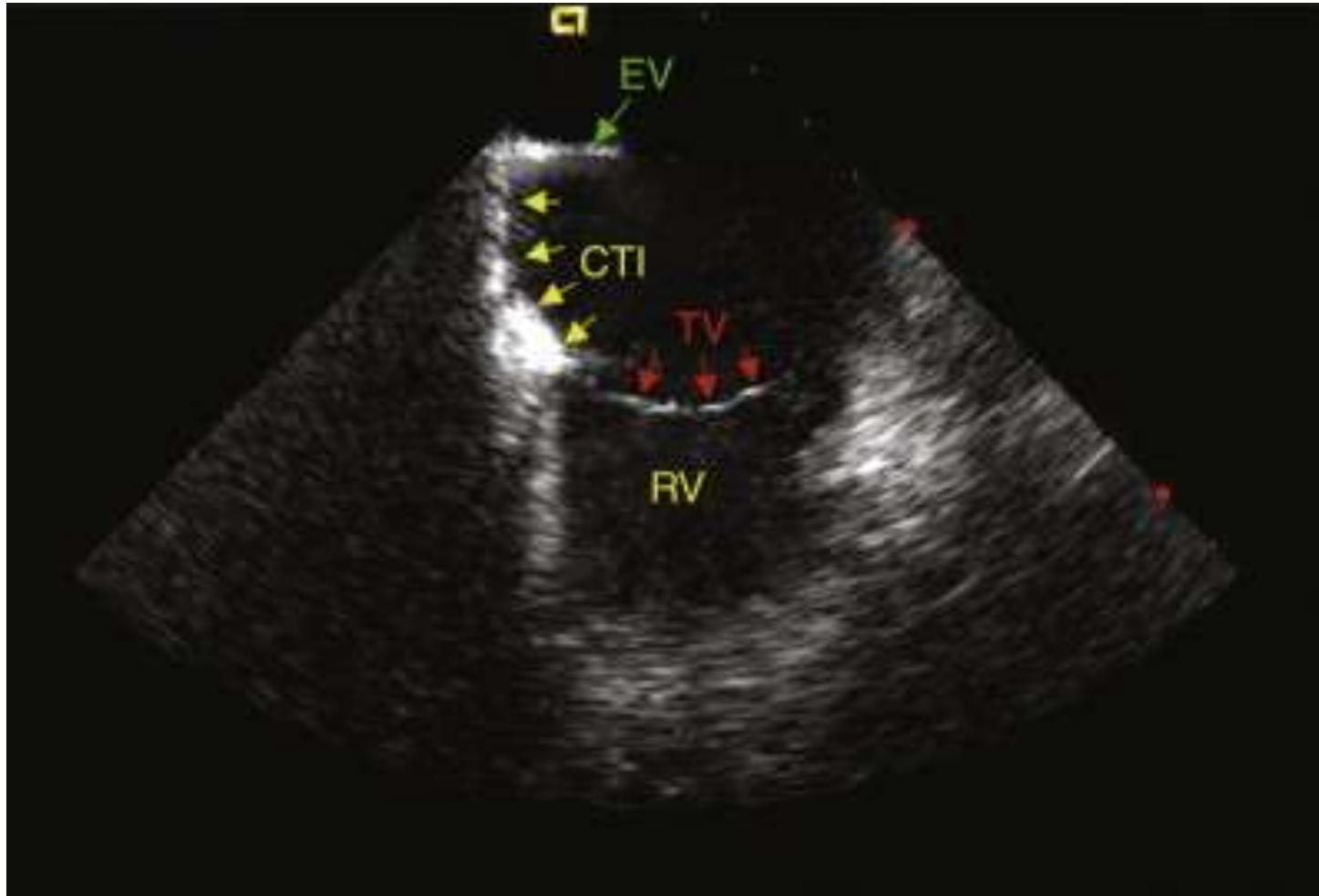
G1: 0-4 (no benefit)

G2: 5-6

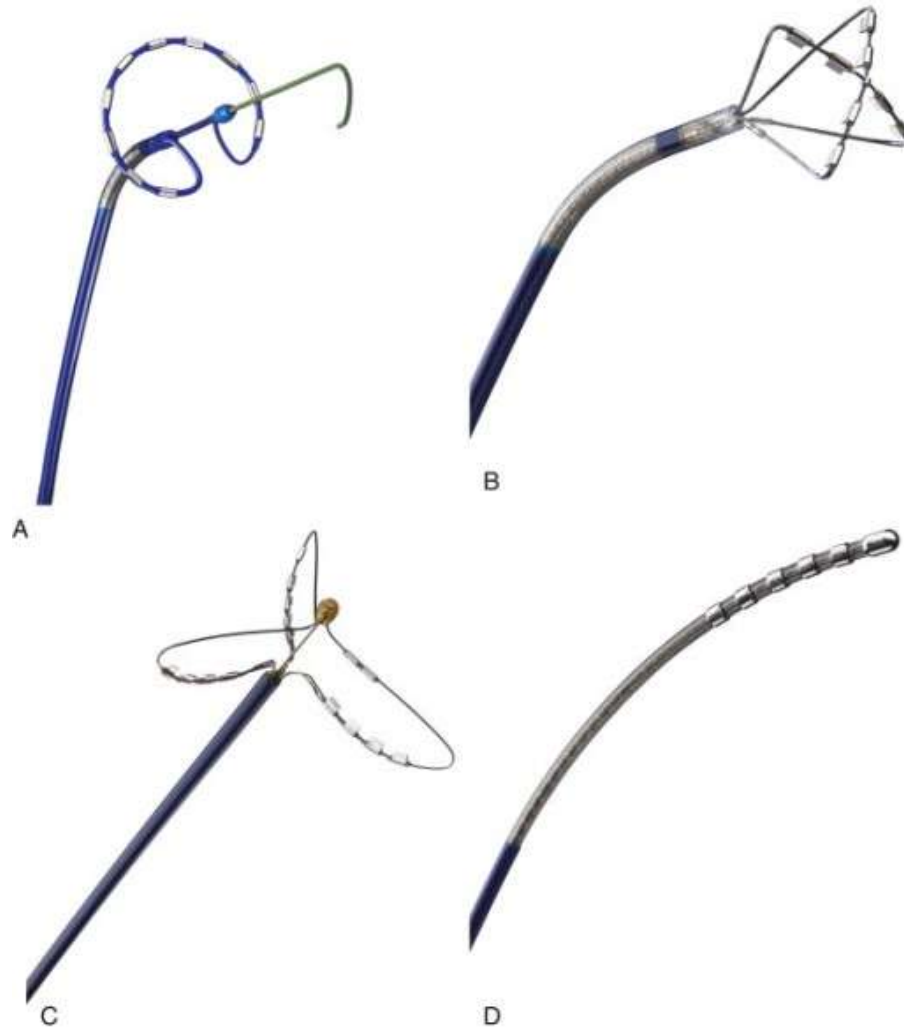
G3: 7-8

D4: 9-10

Intracardiac Echo



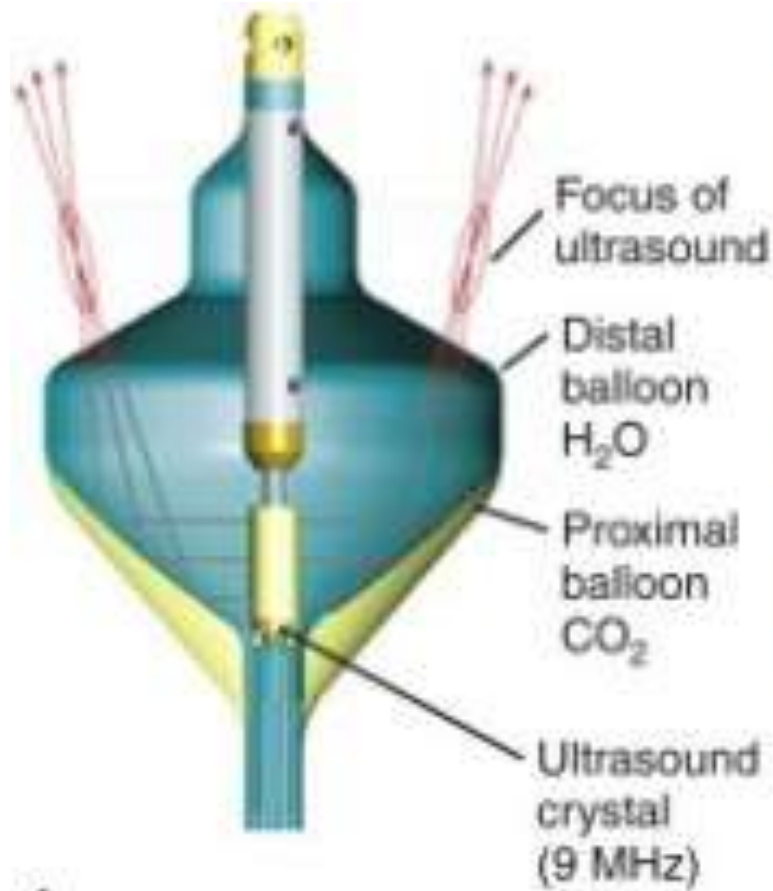
Novel Multipolar Electrode catheters



Novel Cryoablation Modalities (Cryothermal Balloon Catheter)



High-intensity Focused Ultrasound (HIFU) Balloon Catheter



Laser Balloon



PRIORITIES FOR TRAINEES IN CARDIAC ELECTROPHYSIOLOGY

- Basic principles underlying diagnostic EPS
- Study of narrow and wide-complex tachycardias
- EPS for features of common cardiac arrhythmias
- Standard techniques for ablation