Ablation of Posteroseptal APs - Tips/Tricks

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Disclosure

Consulting:
- Biosense Webster
- Endosense
- Rhythmia Medical
- ACT
- VytronUS
- Boston Scientific

Lecture Honoraria:
- St Jude Medical
- Biosense Webster
- Boston Scientific
- Biotronik
- Medtronic

Posteroseptal Accessory Pathways

Based on Original Duke Surgical Ablation Experience

LAO Projection

Right Midseptal and Posteroseptal Accessory Pathways

LAO Projection
Great Cardiac Vein

Tricuspid Annulus

Mitral Annulus

Right Midseptal and Posteroseptal Accessory Pathways

- Earliest Antegrade V
- Earliest Retro A (±)
- AP Potential

Right Midseptal and Posteroseptal Accessory Pathways

- Earliest Antegrade V
- Earliest Retro A (±)
- AP Potential

Oblique Course
Great Cardiac Vein

Right Midseptal and Postero-septal Accessory Pathways

- Earliest Antegrade V
- Earliest Retro A (±)

Pacing RAA

Oblique Course

Short Local A-V at the Site of Earliest Ventricular Activation (25 ms)

Right Midseptal and Postero-septal Accessory Pathways

- Earliest Antegrade V
- Earliest Retro A (±)

Pacing CS

Oblique Course

Reverse Direction of Atrial Activation

Not Usually at Same Location

Pacing RAA

Not Usually at Same Location
Right Midseptal and Posteroseptal Accessory Pathways

- Earliest Antegrade V
- Earliest Retro A (±)

Not Usually at Same Location

Oblique Course

Reverse Direction of Atrial Activation

Marked Increase in Local AV Interval at Site of Earliest Ventricular Activation (45 ms)

Oblique Course Allows Identification of the AP Potential

AP Potential Obscured by Local Atrial Potential

Short Local A-V (25 ms)

Long Local A-V (45 ms)
Safety in Septal Accessory Pathway Ablation

Midseptal APs

- Prevent AV Block
  - Keep ablation electrode on ventricular side of tricuspid annulus

Safety in Septal Accessory Pathway Ablation

Midseptal APs

- Prevent AV Block
  - Keep ablation electrode on ventricular side of tricuspid annulus
  - Unipolar tip electrogram (Uni 1) records AP potential but no atrial potential

Ablation of High Midseptal AP

Targeting a High Midseptal AP
Targeting a High Midseptal AP

Targeting a High Midseptal AP

Ablation of Midseptal AP

Reduce Risk of AV Block
Ablation Catheter Beneath Septal Leaflet of Tricuspid Valve

RAA
HB
RV
CS
MS TA
RAO Projection
Posteroseptal Accessory Pathways

LAO Projection

Tricuspid Annulus

Mitral Annulus

Coronary Sinus

Great Cardiac Vein

HB

Left Midseptal AP

During Retrograde AP Conduction: Similar Timing of Atrial Activation in HB and Proximal CS Electrograms

Major Clue to Left Midseptal Location

9/7/2012

LAO Projection

Tricuspid Annulus

Mitral Annulus

Coronary Sinus

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HB

Left Midseptal AP

During Retrograde AP Conduction: Similar Timing of Atrial Activation in HB and Proximal CS Electrograms

Major Clue to Left Midseptal Location
AVRT – Postero septal AP

Similar Timing of Retrograde Atrial Activation in HB and Prox CS Electrograms

Left Midseptal Accessory Pathways

Similar Timing of Retrograde Atrial Activation in HB and Proximal CS

Push Mapping Catheter Against Roof of the CS Ostium

Records Farfield Activation From Left Midseptal Region

Roof of CS Os
(Record Farfield Left Midseptum)
Avoid Ablation at this Site
1. Only Transient AP Block (Late Recurrence)
2. Risk of Fast Pathway Block

Midseptal Mitral Annulus

Far-Field AP Potential Recorded from Roof of CS Os

Far-Field AP Potential Recorded from Roof of CS Os

100 ms
Midseptal Mitral Annulus Accessory Pathways

12 Patients

Midseptal Mitral Annulus

11/12 – Prior Failed Ablation

Posteroseptal Accessory Pathways

- Earliest Antegrade V
- Earliest Retrograde A

12 Patients

Midseptal Mitral Annulus

Posteroseptal Accessory Pathways

Left Posteroseptal AP

Tricuspid Annulus
Great Cardiac Vein

Posteroseptal Accessory Pathways

- Earliest Antegrade V
- Earliest Retrograde A
- Usually Oblique:
  
  AP Potential

4 yo Male - PJRT
Prior Failed RF

Anterior-Superior CS Ostium

RF #1 at Anterior-Superior CS Ostium
IVC

CS Myocardial Coat

Middle Cardiac Vein

Great Cardiac Vein

Posterior Coronary Vein

Courtesy of Anton Becker

Great Cardiac Vein

Middle Cardiac Vein

Posterior Coronary Vein

LA-CS Connections

Courtesy of Anton Becker

240 Human Hearts

CS Myocardial Coat

CS Myocardial Extensions

Great Cardiac Vein

Isolated Myocardial Belts (9%)

Posterior Coronary Vein (PCV)

CS Myo Extension Over PCV (2% Hearts)

CS Myo Extension Over MCV (3% Hearts)

Middle Cardiac Vein (MCV)

Michael v Ludinghausen et al, Clinical Anatomy 1992
**Coronary Sinus-Ventricular Connections**

- **Retrograde Conduction**
  - LA Activ
  - CSE
  - LV Activ

- **LAO Projection**

Sun, Jackman, et al, Circulation 2002
Coronary Sinus-Ventricular Connections

Retrograde Conduction

3 Potentials in CS/MCV
1. Retrograde CSE (AP)
2. CS Myocardium
3. Left Atrium

Sun, Jackman, et al, Circulation 2002

LAO Projection
Retrograde AP Conduction (AVRT)

1st Retrograde Potential - Activation of CS Extension

2nd Retrograde Potential - Activation of CS Myocardium

Retrograde AP: 2 Potentials in CS

CS Potential First: LV-CS Connection (Epi PS AP)

LA Potential First: Conventional A-V Connection

3rd Retrograde Potential - Activation of Left Atrium
Retrograde AP: 2 Potentials in CS

CS Potential First: LV-CS Connection (Epi PS AP)
LA Potential First: Conventional A-V Connection

Identify Origin of the Potentials
Use a Late Atrial Extrastimulus – LA will be Advanced Before CS Myocardium

LAO Projection

LA Potential First: Conventional A-V Connection

Identify Origin of the Potentials
Use a Late Atrial Extrastimulus – LA will be Advanced Before CS Myocardium

LAO Projection

LV Pacing Site

Ideal Ventricular Pacing Wavefront

LAO Projection
Late Atrial Extrastimulus

CS Potential Precedes Atrial Potential
- A Advanced
- CS Unchanged

Late Atrial Extrastimulus

CS Potential Precedes Atrial Potential
- A Advanced
- CS Unchanged

Coronary Sinus-Ventricular Connection
(Epicardial Posteroseptal Accessory Pathway)

1. V₃-V₂ Transition: Septal
1. $V_1$-$V_2$ Transition: **Septal**

2. Delta in aVF: 
   - Negative – Level at or below CS Os

3. Delta in Lead II: 
   - Steep Negative – Epicard PSAP

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Coronary Sinus-Ventricular Connection (Epicardial Posteroseptal Accessory Pathway)

1. $V_1$-$V_2$ Transition: **Septal**

2. Delta in aVF: 
   - Negative – Level at or below CS Os

3. Delta in Lead II: 
   - Steep Negative – Epicard PSAP

Very Specific, Less Sensitive (70%)
Delta Wave in Lead II

- Negative
- Isoelectric

I

II

- Epicardial PS AP (CS-LV Connection)
- Right Posterolateral AP (Not Epicardial AP)

Targeting Earliest Retrograde Activation

- Retrograde Conduction

Earliest LA Activ

LA Activ

RF

CSE

LAO Projection

Great Cardiac Vein

Small Cardiac Vein

Middle Cardiac Vein

Posterior Coronary Vein

LV Activ

LA Activ

Earliest LA Activ

Local Block with Shift in Site of Earliest LA Activ

RF

CSE

LAO Projection

Great Cardiac Vein

Small Cardiac Vein

Middle Cardiac Vein

Posterior Coronary Vein

LV Activ

LA Activ

Earliest LA Activ
Targeting Earliest Retrograde Activation

Retrograde Conduction
Local Block with Further Shift in Site of Earliest LA Activ

RF
LA Activ
Earliest LA Activ

Coronary Sinus Ostium
Great Cardiac Vein
Posterior Coronary Vein
Small Cardiac Vein
Middle Cardiac Vein
CSE
LV Activ
LA Activ

LAO Projection

Targeting Earliest Retrograde Activation

Retrograde Conduction

RF
LA Activ
Earliest LA Activ

Coronary Sinus Ostium
Great Cardiac Vein
Posterior Coronary Vein
Small Cardiac Vein
Middle Cardiac Vein
CSE
LV Activ
LA Activ

LAO Projection

Targeting Earliest Retrograde Activation

No Further Shift in Site of Earliest LA Activ

RF
LA Activ
Earliest LA Activ

Coronary Sinus Ostium
Great Cardiac Vein
Posterior Coronary Vein
Small Cardiac Vein
Middle Cardiac Vein
CSE
LV Activ
LA Activ

LAO Projection

Ablation at Site of Earliest Retrograde AtrialActiv

Great Cardiac Vein
Posterior Cardiac Vein
CS Myocardial Coat
Middle Cardiac Vein
IVC
Ablation at Site of Earliest Retrograde Atrial Activ

Dense LA – CS Connections

Ideal Ablation Site

Ablation in Middle Cardiac Vein (Ventricular Connection)

Ablation of CS-Ventricular Connections

Retrograde Conduction

Earliest LA Activ

Ideal Ablation Site

LA

LA Activ

Great Cardiac Vein

Great Cardiac Vein

Small Cardiac Vein

CSE

CS Myo Extn–LV Connection

LV

Posterior Cardiac Vein

Middle Cardiac Vein

Posterior Cardiac Vein

Middle Cardiac Vein

Middle Cardiac Vein

CS Myocardial Coat

CS Myocardial Coat

Great Cardiac Vein

Great Cardiac Vein

Great Cardiac Vein

Great Cardiac Vein

Posterior Cardiac Vein

Posterior Cardiac Vein

Posterior Cardiac Vein

Posterior Cardiac Vein

IVC

IVC

IVC

IVC
Ablation Technique
Use Saline Irrigated Electrode Catheter
- Will have impedance rise
  • Irrigated RF
    - 15 ➔ 25 Watts
    - Terminate RF IMMEDIATELY at beginning of any possible Impedance Rise (5 Ohms)

Ablation Technique
Use Saline Irrigated Electrode Catheter
- Will have impedance rise

Prior Unsuccessful Ablation in MCV
Prior Unsuccessful Ablation in MCV

Selecting the Ablation Site

Too Deep
Ablation of Epicardial Posteroseptal Accessory Pathway (CS-LV Connection)

Ablation From the Middle Cardiac Vein (MCV)

LAO Projection

Ablation of Epicardial Posteroseptal Accessory Pathway

Deeper in MCV than CSE-LV Connection (No Unipolar CSE Potential)
Catheter Pullback in MCV

**Pre-RF1**

**Post-RF1**

Loss of CSE
Right Coronary Angiography

LAO

RAO

RF Ablation in Middle Cardiac Vein

RCA Close to CS at Orifice of MCV

LAO

RAO

Right Coronary Artery - RF Injury

Before RF Ablation

After 1 RF Application in Middle Cardiac Vein (MCV)

90% Stenosis

LAO Projection

Chronic Right Coronary Artery Stenosis

14 Yr Male
5 yrs after RF in CS Ostium
RF Ablation Deep in Middle Cardiac Vein

- Avoids Distal RCA
- RCA Close to CS at Orifice of MCV
- No Stenosis
- Ablation Site
- Pre-Ablation
- Post-Ablation

Epicardial Posteroseptal Accessory Pathways

- 79 Patients
- Distance Between Ideal Ablation Site and Coronary Artery

- ≤ 2mm: 54 Pts (68%)
- 2mm - 5mm: 7 Pts (8%)
- ≥ 5mm: 18 Pts (24%)

Arterial Injury: 2/3 Pts (67%)

Sun, Jackman et al. J AM Coll Cardiology 2001;880:131A

Thank You!