From Vein Puncture to CS Cannulation

Il-Young Oh, MD
1. Accessory Hemiazygos Vein
- Ascending lumbar vein (left)
- Posterior intercostal veins (left 4–8th)
- Esophageal veins
- Mediastinal veins
- Superior phrenic veins (left)

2. Hemiazygos Vein
- Ascending lumbar vein (right)
- Posterior intercostal veins (right 5–11th)
- Esophageal veins
- Mediastinal veins
- Pericardial veins
- Bronchial veins (right)
- Right superior intercostal vein

3. Azygos Vein

4. Superior Vena Cava

5. Heart (Right Atrium)

*Distal (vertebral and intercostal veins) to Heart (right atrium)
Extrathoracic introducer insertion technique

The introducer needle must remain between the med. and lat. edges of the 1st rib.

Pacing Clin Electrophysiol. 1993;16:1781-1784
Internal jugular vein

External jugular vein

1st rib

2nd rib

Cephalic vein

Axillary vein

Brachial vein

Basilic vein
Opened right atrium: right lateral view
M/56 s/p AVR, MVR
Fluoroscopy after CRT implantation
Three principal tributaries of CS

- Great cardiac vein
  - Anterior Intraventricular vein (before annulus)
  - Coronary sinus (after vein of Marshall)
- Posterolateral vein
- Middle cardiac vein
Vieussens’ valve

- Vieussens’ valve is also frequently seen at the ostium of the primary posterolateral vein opposite to the opening of the vein of Marshall.
- May make cannulation of the posterolateral vein challenging

Coronary sinus and age

F/22 AVNRT 1947002*
F/37 VPBs 2153343*
F/43 AVNRT 1444744*
F/76 AT 1634368*
F/60 AVNRT 1965105*
M/51 AVRT 1933308*
CS recording – Sup. Vs. Inf. approach

Superior approach

Inferior approach
Abbott

- Inner diameter 7 F
- Outer diameter 9 F
- Inner catheter 50°, 90°
- Inner diameter 7.3F
- Outer diameter 8.7F
- Inner catheter 50°, 90°
- Inner diameter 7.8F
- Outer diameter 9.2F
- Inner catheter 90°, 130°
- Inner diameter 7.2 F
- Outer diameter 9 F
- Inner catheter 130°, 90°
Quartet™ 1458Q
Large S-curve
20-30-47 mm

Quartet™ 1457Q
Double Bend
20-30-47 mm

Quartet™ 1458QL
Large S-curve
20-47-60 mm

Quartet™ 1456Q
Small S-curve
20-30-40 mm

Quartet™ Family of LV Leads

Abbott

• Lead body diameter 4.7 F
• Electrode diameter 5.1 F
• Distal tip diameter 4.0 F
• Lead body diameter 4.3 F
• Distal tip diameter 4.0 F
4 F Quadripolar

- Sentus ProMRI OTW QP L
  - 2D S-curve
  - Any position

4 F Bipolar

- Sentus ProMRI OTW BP L
  - 2D S-curve
  - Any position

- Tip electrode 4.8 F
- Ring electrode 4.8 F
- Conductor 4.8 F

Smaller veins

- Sentus ProMRI OTW QP S
  - Silicone thread
  - Wedge position
Boston Scientific

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<th>ELECTRODE SPACING</th>
<th>FIXATION METHOD</th>
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5.4 F

ACUITY™ X4 Spiral L
- AP venogram shows a posterior lateral vein
- ACUITY X4 Spiral L lead wedged in the lateral vein

ACUITY™ X4 Spiral S
- AP venogram shows a lateral vein
- ACUITY X4 Spiral S lead wedged in the lateral vein

ACUITY™ X4 Straight
- AP venogram shows a narrow lateral vein
- ACUITY X4 Straight lead wedged in the lateral vein
Medtronic

- Lead body diameter 5.3 F
- Electrode diameter 5.1 F
- Distal body diameter 4.0 F
F/35 Coronary venogram
- Complete AV block s/p TVR
Fluoroscopy after LV lead implantation
Chest AP 1 day after implantation
ECG 3 days after implantation
Chest PA 1 month after implantation
ECG 1 month after implantation
EOL 2 years after epicardial pacemaker implantation
Coronary sinus cannulation using 7F decapolar catheters with lumen (1)
Confirmation of catheter location

LAO 20 degree

RAO 26 degree
Coronary sinus cannulation using 7F decapolar catheters with lumen (2)

LAO 20 degree

Initial shape of 7F decapolar catheter
After shaping of catheter
Visualization of coronary sinus

LAO 40 degree

RAO 40 degree
Lateral branch engagement of CS catheter

LAO 40 degree

RAO 40 degree
Unfavorable cardiac vein anatomy

- Pre-operative multislice computer tomography (MSCT)
- Trasvenous vs. surgical LV lead implantation

The pre-operative knowledge of CS main branches anatomy, gained by MSCT, allows the screening of patients with unfavorable anatomic patterns.
Coronary sinus in Cardiac CT (1)

CS venogram, RAO

CRT protocol CT

1: anterior interventricular vein, 2: lateral vein, 3: middle cardiac vein
Coronary sinus in Cardiac CT (2)

CS venogram, RAO

CRT protocol CT

1-3: lateral veins

4: middle cardiac vein

F/75 CRT
Tip for vein puncture and CS cannulation

- Call senior doctor.
- Identify the X-ray markers of the fluoroscopy and use the venogram.
- Change the approach – superior or inferior.
- Change the catheter (lumen) or the shape of catheter.
- Use the proper inner sheath for CS engagement and guiding support.
- Remind the change of CS angle according to age.
- Perform pre-CRT cardiac CT and check the anatomy of CS.