Lead Displacements -
Never Say Never

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Case 1

• 73 year old female
• First presented with palpitations and breathlessness, NYHA class II
• Investigations:
  – 12 lead ECG shows sinus rhythm with LBBB, QRS width 158ms
  – No arrhythmia on 24 hour holter monitor
  – Echo shows severe LV impairment, ejection fraction 30-35%
  – Normal CT angiogram
  – No fibrosis on cardiac MRI
CRT implant

• Boston Scientific Valitude CRT-P implanted in December 2015 for non-ischaemic cardiomyopathy of uncertain cause

• Uncomplicated case
  – Boston Scientific active leads 7741 in RA appendage and 7742 placed on mid RV septum
  – Boston Scientific Steerable LV lead placed in target lateral branch of the coronary sinus
  – LV lead pulled back slightly on slitting the CS catheter but parameters remained satisfactory (threshold 0.7V@0.5ms)
Follow-up in pacing clinic

• January 2016
  – Feeling well, 100% biventricular pacing
  – Paroxysmal AF identified – started on warfarin
  – LV threshold 1.1V@0.5ms

• May 2016
  – Remains well with 100% biventricular pacing
  – LV threshold 1.1V@0.5ms

• November 2016
  – Now RV paced 100% but LV paced 80%
November 2016 trends

Pacing percentage trends

LV lead sensing and impedance trends
November 2016 on interrogation
Sensing test in VVI
LV threshold in VVI
Where has the LV lead displaced?

A. Right Atrium  
B. Right Ventricle  
C. Coronary sinus  
D. Perforated  
E. It hasn’t moved, there is another explanation for the loss of LV pacing
RV pacing in VVI
LV lead displacement
LV lead displacement

• Far-field atrial oversensing by the LV channel occurs mostly with LV displacement\(^1\)
  – Interferes with delivery of CRT
  – May be rectified by reprogramming sensitivity if LV threshold is acceptable

• Returned to cath lab for LV lead reposition
  – Warfarin stopped 5 days prior to procedure
  – Original target lateral vessel appeared to have thrombosed
  – New LV lead (Easytrak 3) placed in posterolateral branch of the CS

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Post LV lead replacement
CRT complications

- In a similar published case, CS thrombus was thought to be precipitated by displacement of the LV lead and discontinuation of warfarin²
- Obstruction of the CS by thrombus may present with acute dyspnoea³; the lack of symptoms are consistent with partial obstruction
- DCM patients have a higher risk of late (>90 days) complications compared to those with ischaemic heart disease with a mean time to late LV lead displacement of 6.8 ± 4 months in one study⁴

Case 2

• 67 year old male presented to ED with a sudden onset of severe dizzy spells
• Not under Cardiology follow-up at Addenbrooke’s, but patient reports:
  – AV node ablation + PPM in 2006
  – Upgraded to Medtronic Syncra CRT-P early 2016
• No recent fall or any interventions
• Physiologists asked to attend, informed the ECG shows pauses but the patient is better with a pacing magnet applied
What is the most likely cause?

A. RV lead fracture causing loss of capture
B. Noise on the RV lead
C. Battery has reached EOL
D. Medication changes have increased thresholds to above programmed outputs
12 lead ECG in ED February 2017
12 lead ECG June 2016
On interrogation
RV threshold test
LV threshold test
In the arrhythmia logbook
Chest x-ray
What is going on?

A. Noise on the RV lead due to lead fracture
B. Atrial and RV leads are switched in the can
C. The RV lead has displaced into the RA
D. The atrial lead has displaced into the RV
Further information…

• History obtained from implanting centre
  – Dual RV lead PPM implanted in 2006
    • 52cm lead on RV septum (“RV His position” based on Deshmukh paper in 2000\(^5\))
    • 58cm RV apical lead as back-up due to instability
  – Upgraded to CRT-P in 2016
    • RA port plugged
    • RV septal lead plugged into RV port
    • RV apical lead capped
    • LV lead implanted and in LV port
  – At last check in December 2016 he had no underlying rhythm, lead trends were stable with RV threshold 2.0V@1.0ms, LV threshold 1.5V@1.0ms.

Conclusion

• The RV “His” lead displaced into the RA 10 years after implant
  – Original back-up apical lead now capped
  – LV lead inhibited by RV sensing causing asystole

• Very late displacements of His pacing leads (>6 years) has previously not been described in the literature\(^6\), nor issues with oversensing of AF\(^5\)

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Learning points

• Go back to basics and perform all lead tests
• Difference between LV sensing between manufacturers may affect pacing behaviour
• Thrombus may complicate LV lead repositioning after displacement
• It’s very helpful to know implant history when troubleshooting – check patients carry their ID card
• Never dismiss lead displacement as a possible cause of an apparent pacing malfunction