Is this recovered heart failure?

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Disclosure statement

- I have no relevant financial conflicts of interest to disclose
Case 1

- 25-year old male
  - 2-year h/o non-ischemic CM
  - progressive symptoms
  - reducing dose of BB, ACE-I

- Admitted in shock, started on inotropes
- Failed to wean off inotropes

FH: Aunt with heart transplant at age 20
Baseline
Three weeks after LVAD implant
Eight months after LVAD implant
One year after LVAD implant
# Trajectory of remodeling

<table>
<thead>
<tr>
<th></th>
<th>Preimplant</th>
<th>Implant</th>
<th>2 Months</th>
<th>6 Months</th>
<th>8 Months</th>
<th>12 Months (LVAD off)</th>
<th>2 Weeks Post-explant</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVAD Speed</td>
<td>NA</td>
<td>4</td>
<td>4</td>
<td>4d/3n</td>
<td>3d/2n</td>
<td>2d/1n</td>
<td>NA</td>
</tr>
<tr>
<td>EF (%)</td>
<td>18</td>
<td>&lt;20</td>
<td>5</td>
<td>&lt;20</td>
<td>30-40</td>
<td>61</td>
<td>45</td>
</tr>
<tr>
<td>LVIDd (cm)</td>
<td>6.7</td>
<td>6.5</td>
<td>5.4</td>
<td>5.4</td>
<td>5.1</td>
<td>4.7</td>
<td>5.5</td>
</tr>
<tr>
<td>MR</td>
<td>mild/mod</td>
<td>mod</td>
<td>none</td>
<td>none</td>
<td>trivial</td>
<td>none</td>
<td>trivial</td>
</tr>
<tr>
<td>AV Excursion</td>
<td>normal</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>HF meds (of 5)</td>
<td>NA</td>
<td>NA</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
Transplant vs. LVAD explant?
Berlin Heart experience

LVAD
n=188

Weaned from LVADs
n = 35  (19%)

Recurrence of HF
n = 16

- During 1st year  
  n = 9
- Between 2nd and 5th year  
  n = 4
- After 5 years  
  n = 3

No recurrence of HF
n = 19

- Post-weaning time <3 years  
  n = 6
- Post-weaning time >3 years  
  n = 13

Dandel et al. Circulation 2008
LVAD Working Group (US)

- Enrolled
  \[N=67\]
- Improved
  \[N=23 \ (34\%)\]
- Explanted
  \[N=9 \ (6\%)\]

Maybaum S et al. Circulation 2007; 115; 2497-2505
Harefield Group (UK)

LVAD n=15

max HF med rx

clenbuterol

Explanted n=11 (73%)

EF=60% at 3.4 yrs

No recovery n=4

Died n=1

Birks, Yacoub. NEJM 2006
Harefield Group (UK)

LVAD
n=20

max HF med rx

clenbuterol

Explanted
n=12 (60%)

EF=58% at 1.1 yrs

No recovery
n=8

Died n=1

Birks, Khagani. Circulation 2011
HARPS (US)

LVAD
n=17

max HF med rx

clenbuterol

Withdrawn due to clenbuterol side effects N=4

Explanted
n=1 (6%)

EF=45% at 1.5 yrs

JHLT Abs 2011
Functional status after LVAD explant

Jakovljevic D et al. JACC 2017
Transplant vs. LVAD explant?
One month after LVAD explant
Patient-reported quality of life

KCCQ-12- Kansas City Cardiomyopathy Questionnaire
Case 2

- 22-year-old female
- Non-ischemic cardiomyopathy, 3 years
- HF NYHA IV / stage D, inotrope dependent

LVEDD = 64 mm, EF = 20 %
Case 2

- HMII implant
- Maximized medical therapy:
  - carvedilol 25mg PO BID
  - lisinopril 40mg PO QD
  - spironolactone 25mg PO QD
  - digoxin 0.25mg PO QD
Nine months after LVAD implant

LVEDD = 43 mm, EF= 55 %
Functional studies

- Cardiopulmonary exercise at 6,000 rpm
  - VO2 max = 15.7 ml/kg/min
  - VE/VCO2 at AT = 38

- Right heart catheterization
  - RA 8mmHg
  - PA 45/21/31mmHg
  - PCWP 13mmHg
  - CO 6.4L/min, CI 3.0L/min
  - No significant change with ↓ to 6,000 rpm
Transplant vs. LVAD explant?
Patient-reported quality of life

KCCQ-12- Kansas City Cardiomyopathy Questionnaire
RESTAGE-HF

REmission from Stage D Heart Failure
(RESTAGE-HF)

- Bridge to recovery clinical trial, N=40
- Non-ischemic CM patients
- Med rx: carvedilol, lisinopril, spironolactone, digoxin, losartan

Explant criteria at 6,000 RPM (HMII):
- LVEDD <60mm, LVESD <50mm
- LVEF >45%
- LV filling pressure <15 mmHg
- cardiac index >2.4L/min/m2
- max VO$_2$ >16 ml/kg/min

U Louisville
U Pennsylvania
Cleveland Clinic
Montefiore/Einstein, NY
U Nebraska
U Utah

(Trial sponsored by St Jude/Abbott)
QoL in LVAD recovery cohort

<table>
<thead>
<tr>
<th></th>
<th>Pre-LVAD Eval</th>
<th>Current LVAD</th>
<th>LVAD Explant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>n=9</td>
<td>n=10</td>
<td>n=8</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>53.4 ± 12.2</td>
<td>62.2 ± 14.9</td>
<td>37.3 ± 11.5</td>
</tr>
<tr>
<td><strong>Gender (male)</strong></td>
<td>88.90%</td>
<td>90.00%</td>
<td>50.00%</td>
</tr>
<tr>
<td><strong>Race (caucasian)</strong></td>
<td>77.80%</td>
<td>70%</td>
<td>87.50%</td>
</tr>
<tr>
<td><strong>PRO time from event (median)</strong></td>
<td>-1.0 months</td>
<td>9.9 months</td>
<td>9.5 months</td>
</tr>
</tbody>
</table>

**KCCQ-12**

- Pre-LVAD Eval: 44.0 (7.3)*
- Current LVAD: 53.6 (7.8)
- LVAD Sustained Recovery: 73.8 (9.9)*

* p<0.03

**PROMIS**

- Physical Function†: p=0.012
- Fatigue: p=0.004
- Satisfaction† †: p=0.024
- Depression
Survival goal

- Healthy 22-year old
- Full recovery after explant
- Heart transplant
- LVAD BTR/BTT strategy