STROKE IN VENTRICULAR ASSIST DEVICE PATIENTS

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OBJECTIVES

• Evolution of Mechanical Support and Stroke
• State of the Union of MCS and Stroke
• Treatment and Controversies

SCOPE
ADDRESSING AN UNMET NEED

The VAD patient population is approaching 100,000 in the United States alone.

US population\(^1\) 301,000,000
Target population (35-74 age cohort)\(^1\) 139,100,000
Diagnosed CHF population\(^2\)

- All ages 5,520,000
- 35-74 3,744,000
NYHA Class IIIB and IV\(^3\) in 35-74 age cohort 374,400
Comorbidities estimated in this cohort (280,800)
Target VAD patient population (35-74 years) 93,600

\(^1\) US Census Bureau Statistics (2007)
\(^2\) Heart and Stroke Statistics, American Heart Association
\(^3\) Cardiovascular Round Table research and analysis, The Advisory Board company (2009)

ECONOMIC RAMIFICATIONS

Prevalence 1-2% population 5 million individuals
Cost 1-2% of total health care spending $35 billion
Incidence (per year) 550,000 new diagnoses 300,000 deaths
Hospitalizations 6 days (average) 50% rehospitalized within 6 months

OPTIONS FOR ADVANCED CHF

- Transplant ($$$$$)
- Assist Device ($$$)
- Die ($)
  - Proceeded 6-12 months of medical therapy, many admissions, and hospice ($$)
ADULT HEART TRANSPLANTS
KAPLAN-MEIER SURVIVAL BY ERA
(TRANSPLANTS: JANUARY 1982 – JUNE 2012)

0
20
40
60
80
100

Survival (%)

Years

1982-1991 (N = 21,341)
1992-2001 (N = 39,446)
2002-2005 (N = 13,541)
2006-6/2012 (N = 22,821)


All pair-wise comparisons were significant at p < 0.0001 except 2002-2005 vs. 2006-6/2012 (p = 0.9863).

2014
JHLT. 2014 Oct; 33(10): 996-1008

ADULT HEART TRANSPLANTS
FUNCTIONAL STATUS OF SURVIVING RECIPIENTS BY KARNOFSKY SCORE
(FOLLOW-UPS: JANUARY 2006 – JUNE 2013)

0%
20%
40%
60%
80%
100%

1 Year (N = 12,391)
2 Years (N = 13,501)
3 Years (N = 6,893)

2014
JHLT. 2014 Oct; 33(10): 996-1008

Between June 23, 2006 and June 30, 2014, 159 hospitals participated in INTERMacs and of these, 144 hospitals actively contributed information on a total of 11,796 patients. Cumulative patient accrual and the number of participating hospitals over this time period are displayed below.
THE STROKE PROBLEM

- 15% risk per year
- Increase of pump thrombosis reported by many since 2011
  - Etiology?
  - Increase risk of stroke? Probably
- Compare to baseline risk
  - NYHC Class IV → 5-15% Survival @ 1 year
STROKE IN CHF PATIENTS

- 10-24% of all stroke patients have CHF
- CHF thought to be causative in ~9%
- Risk of stroke 2-3 times higher in CHF patients
- Mortality after stroke more than doubles in CHF
- Annual stroke risk estimated to be 1.3-3.5%

RISK FACTORS FOR STROKE WITH LVAD

- The risk of bleeding and thrombotic events during LVAD support differs by:
  - Age
  - Sex
  - BMI
  - Etiology of heart failure
  - Being a UM fan in 2014

RISK FACTORS FOR HEMORRHAGIC STROKE IN LVADS

- Age (>65)
- Sex (female)
- Prealbumin
- Inotropes
RISK FACTORS FOR ISCHEMIC STROKE IN LVADS

- Sex
- BMI
- BUN
- Total Bili
- Diabetes

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<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>p-value</th>
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<tr>
<td>Blood pressure</td>
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<tr>
<td>BMI</td>
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<td>BUN</td>
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<tr>
<td>Total Bili</td>
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<td>0.004</td>
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<tr>
<td>Diabetes</td>
<td>Yes</td>
<td>0.006</td>
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</tbody>
</table>

STROKE AND INFECTION

PREVENTION-HOW TO ANTICOAGULATE
TREATMENT

• TPA unlikely be effective given composition of embolus
  • High bleeding risk
  • Platelet dysfunction
• Endovascular therapy may hold promise
  • No trials yet
  • Should it depend on initial infarct size?
• Hemorrhagic stroke generally treated with reduction of BP and reversal of anticoagulation

PROGNOSIS

• Limited data on long-term morbidity and mortality
• Stroke remains a leading cause of significant morbidity and mortality
• Stroke jeopardizes transplant status at some centers