USE OF BALLOON VALVOTOMY AS BRIDGE TO SURGERY FOR SEVERE HIGH RISK MITRAL STENOSIS

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RHEUMATIC HEART DISEASE IN AFRICA

- Rheumatic heart disease amongst children and young adults is still prevalent in Africa (7-35 cases/1000 – by echo, 1.7/1000 - clinical)
- Most earlier were studies hospital based, cross-sectional and nit detailed enough. Population studies and REMEDY will bridge this knowledge gap
- Many patients have rheumatic fever and/or rheumatic valve dysfunction and are not aware or are not on follow-up.
- Prevention and timing of intervention is therefore a serious challenge in most African countries
- Mitral valve is by far the most affected valve. Predominantly mitral regurgitation but stenosis also significant
- Mitral stenosis represents a subset of rheumatic fever that follows a slower indolent course mostly showing up at severe stenosis stage
- Inadequate prevention, screening/diagnosis and follow-up
CHALLENGES OF VALVE DISEASE SERVICES IN AFRICA

- Few Catheter interventions Centres (esp. Valve)
- Few “active” facilities for open heart surgery
- Unable to afford the surgery even when available.
- Late/advanced presentations with complications
- Increased high surgical risk/inoperable patients

FREQUENT SCENARIO

- Detailed individual cases analysis/discussions for possible options for helping desperate advanced high risk cases
INDICATIONS FOR PBMV

• SYMPTOMATIC SEVERE MITRAL STENOSIS
  - Suitable (MR grade, other valves, Wilkins score)

• ASYMPOTOMATIC SEVERE MITRAL STENOSIS
  - intended pregnancy/ in pregnancy
  - atrial fibrillation
  - thrombo-embolic phenomena
  - prior to major extra-cardiac surgery
SURGERY IN MITRAL STENOSIS

**INDICATIONS**
- Unavailability of PBMV capabilities
- Unsuitable for PBMV
  (MR grade $>2/4$, other valves involved, Wilkins score $>10$)

**HIGH RISK/CONTRA-INDICATIONS**
- Severe LV dysfunction (LVEF $<30\%$)
- Severe PHTN (systemic PAP or $>100\text{mmHg}$)
- Other organ significant dysfunction (kidney, liver, pulmonary, cerebral)
INDICATIONS FOR PBMV

• SYMPTOMATIC SEVERE MITRAL STENOSIS
  - Suitable (MR grade, other valves, Wilkins score)
  - ? Bridge to surgery for high risk patients (not ideal but will benefit on risk-benefit analysis)

• ASYMPTOMATIC SEVERE MITRAL STENOSIS
  - intended pregnancy/ in pregnancy
  - atrial fibrillation
  - thrombo-embolic phenomena
  - prior to major extra-cardiac surgery
Percutaneous Balloon Mitral Valvotomy (PBMV)

- PBMV has been performed in Kenya since 1994 (Bonhoeffer P, Yonga G., et al Mitral dilatation with the new multi-trac technique. *Cath Cardiovasc Diagn* 36;189,1995.)

- Author has > 1000 case series REPORT
- Series shows < 2% procedure mortality & major complications.
- 10yr event free survival in 84% of cases (Yonga G, Bonhoeffer P et al Long-term results of percutaneous balloon mitral valvotomy using multi-track technique in Kenya. *Eur Heart J* 2009; 30(suppl), 392)

- Method used is predominantly Multi-track double balloon (total cost approx. US$ 3,000/case without catheter re-use).
PATHOLOGY OF MITRAL STENOSIS

Driver for MS pathophysiology is persistently elevated trans-mitral pressure gradient resulting into:-

• reduced cardiac output (vital organs hypoperfusion -renal, coronary, cerebral),

• Lt atrial dilatation, dysfunction, AF & systemic thrombo-embolism

• pulmonary oedema, pulmonary arterial hypertension, right ventricular failure and system venous congestive pathology (hepatopathy, ascites, venous thrombo-embolism)

• Without intervention, functional status does not change and mortality is about 50% within 1yr.
Principal of Bridge PBMV

Significantly reducing trans-mitral pressure gradient will:

• Improve cardiac output, coronary perfusion and LV function, renal & cerebral flow and function.
• Improve LA function, prevent embolism and atrial fibrillation mechanisms
• Relieve persistent pulmonary oedema & HTN, improve RV function and reverse/halt hepatopathy
• Eventually render the patient fit for surgery
Multi-track method of balloon Valvotomy

PRE-PBMV SEVERE MITRAL STENOSIS – 2D

PHT: 307.4ms
MVA: 0.72cm²
PRE-PBMVSEVERE MITRAL STENOSIS DOPPLER
PRE-PBMV SEVERE PULMONARY HTN
POST PBMV MVA
Post PBMV
POST-PBMV MVA DOPPLER

1. MVpeakE = 2.20 m/s
2. MVpeakA = 2.20 m/s
3. MV PHT = 128 msec
   MV DecT = 436 msec
   MVA = 1.72 cm²

E/A: 1.00
## LONGTERM RESULTS – EVENT FREE SURVIVAL

<table>
<thead>
<tr>
<th>STUDY</th>
<th>No.</th>
<th>Av Age (yrs)</th>
<th>Follow up (yrs)</th>
<th>Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohen (1992)</td>
<td>146</td>
<td>59</td>
<td>5</td>
<td>51**</td>
</tr>
<tr>
<td>Orange (1997)</td>
<td>132</td>
<td>44</td>
<td>7</td>
<td>65**</td>
</tr>
<tr>
<td>Ben Farhat (1998)</td>
<td>30</td>
<td>29</td>
<td>7</td>
<td>90*</td>
</tr>
<tr>
<td>Menevean (1998)</td>
<td>532</td>
<td>54</td>
<td>7.5</td>
<td>52*</td>
</tr>
<tr>
<td>Stefanadis (1998)</td>
<td>441</td>
<td>44</td>
<td>9</td>
<td>75*</td>
</tr>
<tr>
<td>Hernandez (1999)</td>
<td>561</td>
<td>53</td>
<td>7</td>
<td>69*</td>
</tr>
<tr>
<td>Iung (1999)</td>
<td>1024</td>
<td>49</td>
<td>10</td>
<td>56**</td>
</tr>
<tr>
<td>Palacios (2002)</td>
<td>879</td>
<td>55</td>
<td>12</td>
<td>33*</td>
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<tr>
<td>Shaw (2003)</td>
<td>405</td>
<td>61</td>
<td>10</td>
<td>42*</td>
</tr>
<tr>
<td>Yonga (EHJ 2009)</td>
<td>422</td>
<td>31</td>
<td>10</td>
<td>84**</td>
</tr>
</tbody>
</table>

* = survival without intervention  
** = survival without intervention & in NYHA class I-II
Research Methods

• Retrospective case series of patients who were candidates for surgery but too sick (clinically very sick, severe PHTN, severe LV dysfunction) and not ideal for PMBV (Wilkin’s score 8-11 and MR ≤2+) and underwent bridge PBMV.

• Cases of “bridge PBMV” done between Jan 2001 to June 2015 and 1yr follow up data available (by mobile phone call & file) were studied.

• Status at 1 month, 3 months, 6 months, and 12 months were recorded where data available.

• Outcome measures:- NYHA functional class, CV complications/admissions for heart valve related problem, heart surgery and cardiac related death.

• Analysis (compared to natural hx of severe mitral valve dx – here-in referred to as NO PBMV)
RESULTS

• Mortality data (main outcome) available for 98%
• Majority of PBMV (80-87%) became eligible for surgery within 3-6mths (NYHA 2, PAP <60mmHg at rest, LVEF>40%, no significant vital organ dysfunction)
• 61% were able to have surgery
• All had mitral valve replacement (MVR) by mechanical prosthesis.
• At 12mths, mortality was significantly reduced (9.9% vs expected 48.5%), complication rates (6.6% vs 18.7%) and NYHA III-IV much less (10% vs 86%)
Mortality

(compare to natural hx of severe MVD)

<table>
<thead>
<tr>
<th>Time</th>
<th>PBMV</th>
<th>NO PBMV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 MONTH</td>
<td>0%</td>
<td>0.80%</td>
</tr>
<tr>
<td>1 MONTH</td>
<td>5.50%</td>
<td>34.40%</td>
</tr>
<tr>
<td>3 MONTHS</td>
<td>5.70%</td>
<td>43.90%</td>
</tr>
<tr>
<td>6 MONTHS</td>
<td>6.60%</td>
<td>48.50%</td>
</tr>
<tr>
<td>12 MONTHS</td>
<td>9%</td>
<td></td>
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</table>
Follow-up Complication rates (CV & other)

- 0% at 0 MONTH
- 1.60% at 1 MONTH
- 4.90% at 3 MONTHS
- 5.70% at 6 MONTHS
- 6.60% at 12 MONTHS

- 0% at 0 MONTH
- 4.50% at 1 MONTH
- 8.10% at 3 MONTHS
- 14.10% at 6 MONTHS
- 8.70% at 12 MONTHS

Lines:
- Blue line: PBMV
- Red line: NO PBMV
Proportions of patients in NYHA class III-IV

- PBMV
- NO PBMV

0 MONTH 1 MONTH 3 MONTHS 6 MONTHS 12 MONTHS

- 87% 85% 86% 84% 86%
- 83% 85% 86% 84% 86%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Conclusions

• Late presentation of severe valve disease remains a significant problem in Sub-Saharan Africa.
• This is complicated by scarce facilities for cardiac surgery, cardiac intervention and inability to afford.
• Need for innovative approaches to improve survival
• Modification of PBMV indications is needed.
Asante daktari