Non Selective Versus Selective His Bundle Versus Right Ventricular Pacing

A comparative study

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Overview

• Introduction and need for the study
• Research question
• Aims and objectives
• Materials and Methods
• Results
• Discussion
• Conclusion
• References
Introduction

• Optimal left ventricular pumping function requires a normal electrical activation sequence with synchronized participation of the distal components of the specialized conduction system.\(^{(1)}\)
• Conventional RV apical pacing
  – Mimics LBBB
  – Results in prolonged QRS duration
  – Ventricular desynchronization
  – Has adverse effects on ventricular structure and function\(^{(2)}\)

• “Forced” ventricular desynchronization due to RV apical pacing may increase risk of atrial fibrillation, heart failure and death.\(^{(3)}\)
• His Bundle pacing - a novel method
  – Produces greater ventricular resynchronization
  – Large reductions in QRS duration
Selective His bundle pacing offers advantages over RV pacing but is also associated with

- Lower R wave sensing
- Higher capture thresholds
- Increased incidence of lead dislodgement
Research Question

• Is non selective His bundle pacing a better alternative?
  – Bridge between RV pacing and selective His bundle pacing
Aim

• To compare three different modalities of pacing with respect to short term and long term outcomes
Objective parameters

A. Short term
   – The capture threshold achieved in theatre and 4 weeks later
   – Lead implantation time
   – Amount of fluoroscopy exposure
   – Amplitude of the R wave achieved

B. Long term
   – Global longitudinal strain
   – Ejection fraction after 2 years
Materials and Methods

• Study Design - Prospective Observational Cohort
• Study Institute - Ramaiah Medical College and Hospitals, Bengaluru, India
• Sample size - 233 Patients
• Follow up - 2 years
Subset numbers

- Right Ventricular pacing - 150 patients
- Selective His bundle pacing - 35 patients
- Non selective His bundle pacing - 48 patients
## Indications for pacemaker insertion

<table>
<thead>
<tr>
<th>Condition</th>
<th>Selective HIS Bundle Pacing (35)</th>
<th>Non Selective HIS Bundle Pacing (48)</th>
<th>RV Pacing (150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SICK SINUS SYNDROME</td>
<td>12(34.3%)</td>
<td>16(33.4%)</td>
<td>64(42.6%)</td>
</tr>
<tr>
<td>ADVANCED AV BLOCK</td>
<td>9(25.7%)</td>
<td>12(25%)</td>
<td>86(57.4%)</td>
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<tr>
<td>LBBB</td>
<td>8(22.9%)</td>
<td>10(20.8%)</td>
<td>----</td>
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<tr>
<td>REDUCED EJECTION FRACTION</td>
<td>6(17.1%)</td>
<td>10(20.8%)</td>
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</tbody>
</table>
RESULTS

Short term outcomes
<table>
<thead>
<tr>
<th></th>
<th>SELECTIVE HIS BUNDLE (35) (GROUP A)</th>
<th>NON SELECTIVE HIS BUNDLE (48) (GROUP B)</th>
<th>RV PACING (150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful implants(%)</td>
<td>60</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Capture threshold (at implant)</td>
<td>1.8 +/- 0.3v</td>
<td>0.9 +/- 0.4v</td>
<td>0.8 +/- 0.5v</td>
</tr>
<tr>
<td></td>
<td>at 1 msec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capture threshold 4 weeks after</td>
<td>2.1 +/- 0.2v</td>
<td>1.0 +/- 0.3v</td>
<td>1.0 +/- 0.4v</td>
</tr>
<tr>
<td>R wave (mv)</td>
<td>2.6 +/- 0.3</td>
<td>10.4 +/- 0.5</td>
<td>11.1 +/- 0.4</td>
</tr>
<tr>
<td></td>
<td>SELECTIVE HIS BUNDLE PACING (35) (GROUP A)</td>
<td>NON SELECTIVE HIS BUNDLE PACING (48) (GROUP B)</td>
<td>RV PACING (150)</td>
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<tr>
<td>------------------------</td>
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<tr>
<td>Fluoroscopy time (min)</td>
<td>20 +/- 8</td>
<td>8 +/- 6</td>
<td>5 +/- 7</td>
</tr>
<tr>
<td>Lead implant time (min)</td>
<td>35 +/- 6</td>
<td>18 +/- 5</td>
<td>9 +/- 6</td>
</tr>
<tr>
<td>Ventricular pacing (%)</td>
<td>&gt;60</td>
<td>&gt;65</td>
<td>&gt;55</td>
</tr>
<tr>
<td>Lead displacement</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

Long term outcomes
<table>
<thead>
<tr>
<th></th>
<th>SELECTIVE HIS BUNDLE PACING (35) (GROUP A)</th>
<th>NON SELECTIVE HIS BUNDLE PACING (48) (GROUP B)</th>
<th>RV PACING (150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Longitudinal strain (2 years)</td>
<td>-22%</td>
<td>-21%</td>
<td>-15%</td>
</tr>
<tr>
<td>LV EF% (after 2 years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) In patients with initial normal EF</td>
<td>58 +/- 3</td>
<td>60 +/- 2</td>
<td>48 +/- 5</td>
</tr>
<tr>
<td>ii) In patients with initial LVEF &lt; 35%</td>
<td>45 +/- 4</td>
<td>44 +/- 3</td>
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</table>
A study done by Sharma et al in 2015\(^4\), sought to assess the feasibility, safety, and clinical outcomes of permanent HBP vs RV pacing and achieved successful HBP in 80% of patients.

- Pacing threshold was higher and Fluoroscopy time was comparable to those of the RV Pacing group.
- Clinical outcomes were better in the HBP group than in the RVP group over a two year follow up period.
• A study done by D Beer, P S Sharma, F A Subzposh et al\(^{(5)}\) in 2019, compared the clinical outcomes of Selective vs Non selective his bundle pacing.

• The outcomes were similar in the two groups in terms of death and heart failure hospitalisations.
Conclusion

1. His bundle pacing is better in terms of short and long term outcomes compared to RV pacing.

2. Non selective His bundle pacing is better in terms of lower capture threshold, taller R wave amplitude, less fluoroscopy exposure and time taken for implantation.

3. Non selective His bundle pacing compares equally well with regard to effect on LV function and could be considered as a good alternative to Selective His bundle pacing.
References


Thank you
Successful DHBP criteria are:

2) pace-ventricular interval equal to His-ventricular interval ± 15 ms
PACING THROUGH THE HIS LEAD