



Permanent His Bundle Pacing Is Associated with Reduction in Morbidity and Mortality Compared to Right Ventricular Pacing: Results From Geisinger His Bundle Pacing Registry.

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Disclosures

MA, DB, BD, AN, JWO: None

- FAS: Speaker (Medtronic)
- GD: Speaker, Consultant, Research (Medtronic)
- PV: Consultant (Boston Scientific);
 Speaker, Consultant, Research (Medtronic)
 Consultant (Abbott)
 Patent pending for His Delivery tool







- Chronic right ventricular pacing (RVP) is associated with increased risk of left ventricular dysfunction secondary to electrical and mechanical dyssynchrony
- Recent studies suggest that the amount of ventricular pacing leading to heart failure hospitalizations (HFH) is as low as 20%
- His Bundle pacing (HBP) depolarizes the ventricles via the His-Purkinje system, inducing a normal synchronous ventricular activation, thus preventing ventricular dyssynchrony





 Determine the feasibility and safety of permanent HBP in a large real-world population requiring permanent pacemakers.

 Evaluate the clinical outcomes of HBP compared to RVP with regards to the composite end point of all cause mortality, first episode of HFH or upgrade to biventricular pacing





Study design

- Nonrandomized, observational cohort study
- Enrollment period: October 2013 to December 2016
- Follow-up period: Implant time until December 2017

Inclusion Criteria:

All patients undergoing a new permanent pacemaker implantation for bradycardia indications

Exclusion Criteria

- 1. Younger than 18 years of age
- 2. Patients undergoing cardiac resynchronization therapy or ICD implantation
- 3. Pre-existing cardiac implantable electronic device.



Participating Centers

Geisinger Medical Center:

All patients underwent Right ventricular pacing (RVP)

Geisinger Wyoming Valley Medical Center *(Geisinger His Bundle registry)*: All patients underwent permanent His bundle pacing (HBP)

The two hospitals are highly-integrated institutions in rural PA, and part of the Geisinger Health System.





Overview of His Bundle Pacing Lead Implantation

Medtronic - SelectSecure[®] 3830 lead with SelectSite catheter

> 4-Fr lead with an exposed screw.

Lead is lumenless and requires a delivery sheath.

Sheath used was the fixed Curve Medtronic C315 His sheath





Complete AV nodal block





Outcomes

Primary:

The composite end point of all cause mortality, first episode of HFH* or upgrade to biventricular pacing.

*HFH was defined as unplanned outpatient or emergency room visit or inpatient hospitalization in which patient presents with signs and symptoms of heart failure and require intravenous diuretic / inotropic therapy.

Secondary

- 1- All cause mortality
- 2- Heart Failure Hospitalization



Statistical Analysis

Intention to treat analysis

Kaplan-Meier curves, univariate and multivariate Cox proportional hazards were used to compare outcomes.

> Competing risk analysis was performed to confirm findings.









Results



Study Flow Chart



- Mean Follow-up duration 725 ±423 days
- > 220 reached the primary endpoint



Results

	His Bundle Pacing (N=332)	<u>RV pacing (N=433)</u>	P-value
Age in years	74.8±11.0	76.4±11.3	0.054
Males	200 (60.2%)	227 (52.4%)	0.03*
Coronary artery disease requiring intervention	71 (21.4%)	77 (17.8%)	0.21
Chronic Kidney Disease	120 (36.1%)	128 (29.6%)	0.053
Heart Failure	85 (25.6%)	135 (31.2%)	0.09
Atrial Fibrillation	189 (56.9%)	193 (44.6%)	< 0.01*
ACE or ARB	243 (73.2%)	317 (73.2%)	0.99
Beta Blockers	262 (78.9%)	315 (72.8%)	0.049*
Baseline Ejection Fraction %	54.9±8.5	54.2±10.2	0.28
Baseline QRS duration	104.5±24.5	110.5±28.4	< 0.01*
Sinus Node Dysfunction	118 (36%)	152 (35%)	0.9
AV conduction Disease	214 (64%)	283 (65%)	0.8



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Procedural Characteristics

	His Bundle pacing (n=304)	RV pacing (n=433)	P-value
Procedure duration (min)	70.21±34	55.02±25	<0.01*
Fluoroscopy duration (min)	10.27±6.5	7.40±5.1	<0.01*
Implant Capture threshold (V @ ms)	1.30±0.85 @ 0.79±0.26	0.59±0.42 @ 0.5±0.03	<0.01*
Last follow up Capture threshold (V @ ms)	1.56±0.95 @ 0.78±0.30	0.76±0.29 @ 0.46±0.09	<0.01*
QRS duration (ms)	104.5±24.5	110.5±28.4	<0.01*
Paced QRS duration (ms)	128±27.7	166±21.8	<0.01*



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Primary Outcome (Death, HFH or upgrade to biventricular pacing)

	His Bundle Pacing (n=332)	RV Pacing (n=433)	HR	CI	p-value
All Patients	83 (25%)	137 (31.6%)	0.71*	0.53-0.94	0.02
	His Bundle Pacing (n=194)	RV Pacing (n=278)	HR	CI	p-value
Patients with VP >20%	49 (25.3%)	99 (35.6%)	0.65*	0.46-0.93	0.02
	His Bundle Pacing (n=125)	RV Pacing (n=152)	HR	CI	p-value
Patients with VP <20%	27 (22%)	36 (23.7%)	0.78	0.47-1.30	0.34

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* Analysis by multivariate regression model



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Primary Outcome (Death, HFH or upgrade to biventricular pacing) -All patients-



Primary Outcome (Death, HFH or upgrade to biventricular pacing) -*Patients with VP* >20%-



Heart Failure Hospitalizations

		His Bundle pacing (n=332)	RV Pacing (n=433)	HR	CI	р	
All Detiente	Heart Failure Hospitalizations	44 (40 40/)	70 (47 00/)	0.63*	0.43-0.93	0.02	
All Patients Competing Risk Analysis (mortality as competing		41 (12.4%)	76 (17.6%)	0.68	0.46-0.99	0.045	
		His Bundle pacing (n=194)	RV Pacing (n=278)	HR	CI	р	
<u>Patients with</u> VP >20%	Heart Failure Hospitalizations	24 (12.4%)	56 (20.1%)	0.54*	0.33-0.88	0.01	
	Competing Risk Analysis (mortality as competing risk)	eting risk)	(mortality as competing risk)		0.57	0.35-0.94	0.03
		His Bundle pacing (n=125)	RV Pacing (n=152)	HR	CI	р	
Patients with	Heart Failure Hospitalizations			0.88	0.45-1.69	0.69	
<u>vr <20%</u>	Competing Risk Analysis (mortality as competing risk)	16 (13%)	20 (13.2%)	0.88	0.46-1.68	0.69	

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Heart Failure Hospitalizations

		His Bundle pacing (n=332)	RV Pacing (n=433)	HR	CI	р	
All Detients	Heart Failure Hospitalizations	44 (40 40/)	70 (47 00/)	0.63*	0.43-0.93	0.02	
All Patients	Competing Risk Analysis (mortality as competing risk)		76 (17.6%)	0.68	0.46-0.99	0.045	
		His Bundle pacing (n=194)	RV Pacing (n=278)	HR	CI	р	
Patients with	Heart Failure Hospitalizations	alizations 24 (12.4%) lity as competing risk)	56 (20 1%)	56 (20.1%)	0.54*	0.33-0.88	0.01
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Patients with	Heart Failure Hospitalizations	4.0 (4.00/)	00 (40 00()	0.88	0.45-1.69	0.69	
<u>vr <20%</u>	Competing Risk Analysis (mortality as competing risk)	10 (13%)	∠ ∪ (13.2%)	0.88	0.46-1.68	0.69	

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Heart Failure Hospitalizations



All- Cause Mortality

	His Bundle Pacing (n=332)	RV Pacing (n=433)	HR	CI	p-value
All Patients	57 (17.2%)	93 (21.4%)	0.73	0.52-1.01	0.06
	His Bundle Pacing (n=194)	RV Pacing (n=278)	HR	CI	p-value
Patients with VP >20%	35 (18%)	66 (23.7%)	0.69	0.46-1.04	0.07
	His Bundle Pacing (n=125)	RV Pacing (n=152)	HR	CI	p-value
Patients with VP <20%	15 (12%)	25 (16%)	0.64	0.34-1.22	0.17



All- Cause Mortality



	HBP (n=332)	RVP (n=433)
Upgrade to biventricular pacing	1	6
	HBP (n=332)	RVP (n=433)
Lead revision	14	2
Pericardial effusion	0	3
Lead Infection	1	1
Generator change	1	0







- Non-randomized study
- Possible selection bias secondary to location and the clinical practice of the treating hospital
- 85% of the his bundle pacing cases were performed by electrophysiologists with extensive experience in HBP





Conclusions

- Permanent HBP was feasible and safe in a large real-world population requiring permanent pacemakers.
- HBP was associated with significant reduction in the composite endpoint of all-cause mortality, HFH or upgrade to biventricular pacing compared to RVP.
- This difference in clinical outcomes was primarily seen in patients requiring >20% ventricular pacing.







Thank you for your attention





