Role of Percutaneous Left Ventricular Assist Devices in Ventricular Tachycardia Ablation

Objectives: The purpose of this study is to evaluate the safety and efficacy of different percutaneous left ventricular assist devices (pLVADs) for hemodynamic support during ventricular tachycardia (VT) ablation.

Background: More than half of the patients referred for VT ablation have hemodynamically unstable VTs necessitating early termination during the ablation procedure. Use of pLVADs for hemodynamic support during the procedure may enable us to maintain patients in unstable VTs for longer duration and perform a more detailed activating/entrainment mapping making a more limited and precise ablation possible. The relative safety and efficacy of using different pLVADs for VT ablation is very limited.

Methods: We performed a multicenter, observational study from a prospective registry including all consecutive patients undergoing VT ablation with the use of a pLVAD in 6 centers in United States. The selection of the type pLVAD was at the discretion of the physician. Patients with intra aortic balloon pump (IABP group) were compared with patients with either an Impella or a TandemHeart deivce (Non-IABP group).

Results: A total of 66 patients underwent VT ablation using one of the 3 pLVADs. IABP, Impella and TandemHeart devices were used in 22 (33%), 25 (38%) and 19 (29%) patients respectively. There were no significant differences in the baseline characteristics, indications, VT burden, and medication use between the IABP (N=22) and Non-IABP (N=44) groups. In Non-IABP group a) more patients could undergo entrainment/activation mapping (82% vs 59%; p=0.046), b) more number of unstable VTs could be mapped and ablated per patient (1.05 ±0.78 vs 0.32 ±0.48; p<0.001), c) more number of VTs could be terminated by ablation (1.59 ±1.0 vs 0.91 ±0.81; p=0.007) and d) fewer VTs were terminated with rescue shocks (1.93 ±2.2 vs 3.00 ±1.5; p = 0.049) when compared to the IABP group. Acute procedural success (88%), in-hospital complications (26%), VT recurrence (45%) and mortality (30%) during 12±5 month follow-up were not different between both the groups. Left ventricular ejection fraction ≤ 15%

was a strong and independent predictor of both in-hospital (53% vs 4%; $p<0.001$) and long term mortality (65% vs 18%; $p<0.001$).

Conclusion: Impella and TandemHeart implantation for unstable VT ablation may help in performing more activation mapping, ablating more unstable VTs and requiring fewer rescue shocks during the procedure when compared to using IABP. Very low LVEF is a strong predictor of mortality after VT ablation.

Table: Comparison of baseline characteristics, procedural variables and outcomes after VT ablation using different pLVAD

	IABP (N =22)	**Non-IABP Combined (N=44)**	**Non-IABP Subgroups**		**Total (N=66)**	**p value** (IABP vs Non-IABP)
			Impella (N=25)	Tandem Heart (N=19)		
Age in years mean±SD	69.3 ± 9.6	65.6±11.9	68.0 ± 12.0	62.4±13.4	66.8 ±11.9	0.234
Male Sex (%)	21 (96)	41 (93)	23 (92)	18 (95)	62 (94)	0.715
Ischemic Cardiomyopathy (%)	16 (73)	29 (66)	16 (64)	13 (68)	45 (68)	0.575
Atrial Fibrillation (%)	9 (41)	18 (41)	11 (44)	7 (37)	27 (41)	1.00
CRT-D (%)	10 (46)	16 (36)	12 (48)	4 (21)	26 (39)	0.476
Previous VT ablation (%)	7 (32)	15 (34)	7 (28)	8 (42)	22 (33)	0.854
LVEF (%)	24.6 ±10	29.0 ±15	33.3 ±14	23.4 ±13	27.6 ±13	0.213
Amiodarone (%)	16 (73)	27 (61)	16 (64)	11 (58)	43 (65)	0.361
Mexiletine (%)	12 (55)	19 (43)	10 (40)	9 (47)	31 (47)	0.383
ICU Status (%)	13 (59)	19 (43)	9 (36)	10 (53)	32 (49)	0.223
No. of ICD Shocks; mean ±SD	11 ± 10	11± 9.7	7 ± 8	17 ± 9	11 ±10	0.911
Epicardial Ablation (%)	2 (9)	9 (21)	6 (24)	3 (16)	11 (17)	0.243
No. VTs Induced; mean ±SD	3.27±1.5	3.11±1.9	2.48±1.7	3.95±1.8	3.17±1.8	0.733
No. VTs Ablated; mean ±SD	1.82±1.0	2.39±1.3	1.92±1.1	3.00±1.2	2.20±1.2	0.074
No. of Unstable VTs Mapped and Ablated; mean±SD	**0.32 ±0.48**	**1.05±.78**	1.12±0.83	0.95±0.70	**0.80±0.77**	**<0.001**
No. VTs RF Terminated; mean±SD	**0.91±0.81**	**1.59±1.0**	1.16±0.85	2.16±0.90	**1.36±0.99**	**0.007**
Entrianment/Activation Mapping (%)	**13 (59)**	**36 (82)**	20 (80)	16 (84)	**49 (74)**	**0.046**
External Rescue Shocks; mean±SD	**3.00±1.5**	**1.93±2.2**	1.64±2.8	2.32±1.2	**2.29±2.0**	**0.049**
Acute Success (%)	19 (86)	39 (89)	21 (84)	18 (95)	58 (88)	0.790
Complications (%)	3 (14)	14 (32)	9 (36)	5 (26)	17 (26)	0.111
Days in the Hospital mean±SD	7.2 ±3.9	8.2 ±7.7	8.1 ±9.2	8.4 ±5.3	7.9 ± 6.7	0.561
Death in the Hospital (%)	5 (23)	6 (14)	3 (12)	3 (16)	11 (17)	0.350
Recurrence of VT (%)	11 (50)	18 (42)	11 (46)	7 (37)	29 (45)	0.532
Repeat VT Ablation (%)	7 (32)	7 (16)	4 (16)	3 (16)	14 (21)	0.136
Death in 12 months (%)	8 (36)	12 (36)	8 (32)	4 (21)	20 (30)	0.449