The Effect of Percutaneous Left Ventricular Assist Device Placement to the Native Aortic Valve Competency

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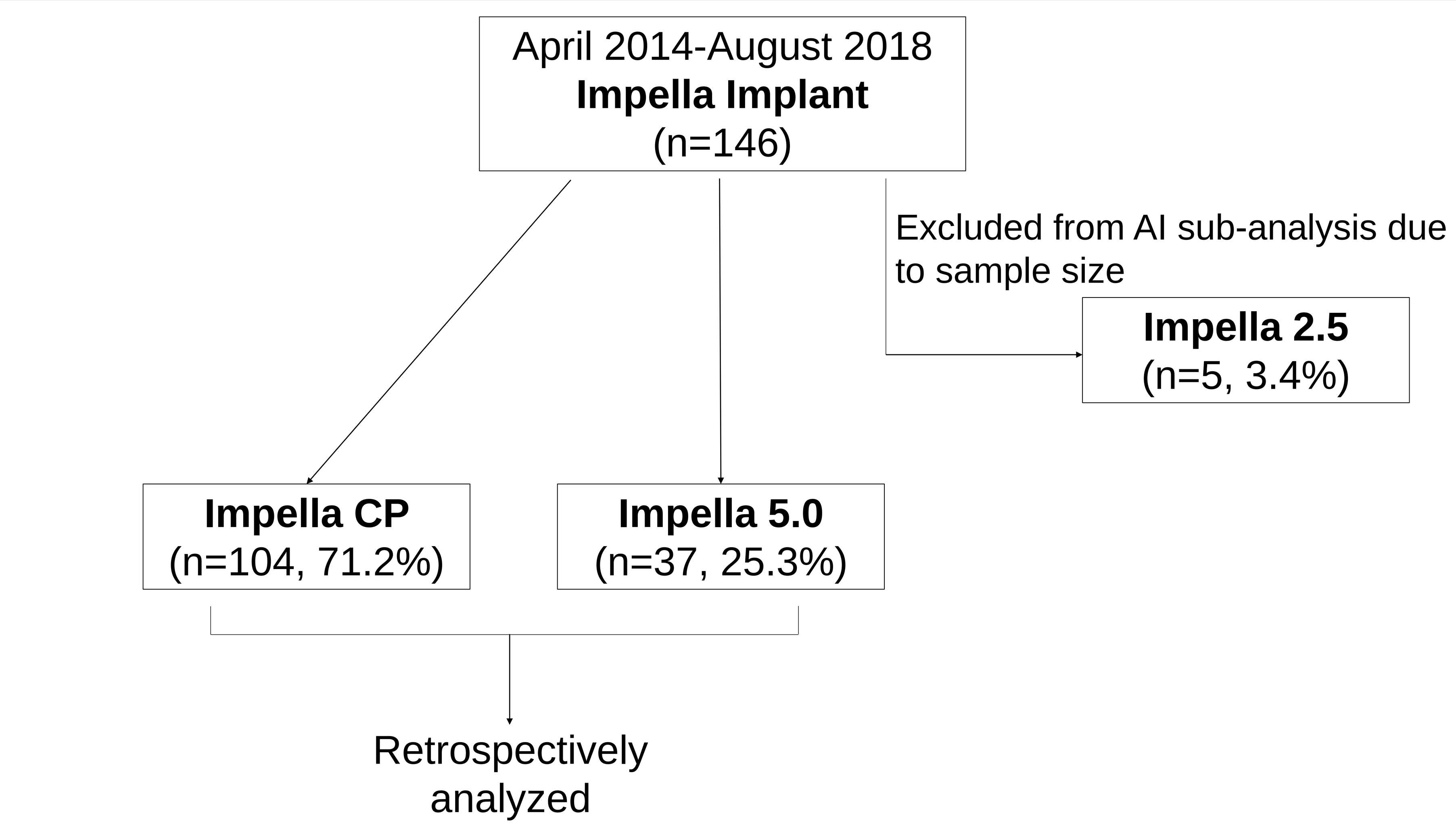
Introduction

- Impella percutaneous left ventricular assist device (LVAD) use is rapidly expanding for cardiogenic shock management.[1]
- The Impella LVAD is delivered through the aortic valve. Due to this design, there is concern that the device may disrupt native valve morphology, causing secondary aortic insufficiency (AI) post-device explant.[1]
- Secondary AI may compromise cardiac function and may further reduce the efficacy of future mechanical circulatory support.
- Prior reports are limited regarding Impella CP and Impella 5.0, and results remain unclear.[2]
- This study sought to characterize the effects of Impella LVAD use on secondary AI after explantation.

Methods

- All patients who received Impella LVAD support between April 2014 and Aug. 2018 at our single center were identified and included.
- Patient demographics, implant indications, duration of support, and pre- and post-implant echocardiograms were retrospectively analyzed. A Mann-Whitney U Test was performed on AI analysis.
- Impella CP and Impella 5.0 patients were sub-analyzed separately.
- Any AI complications requiring surgical intervention resulting from Impella use were reviewed.



Results

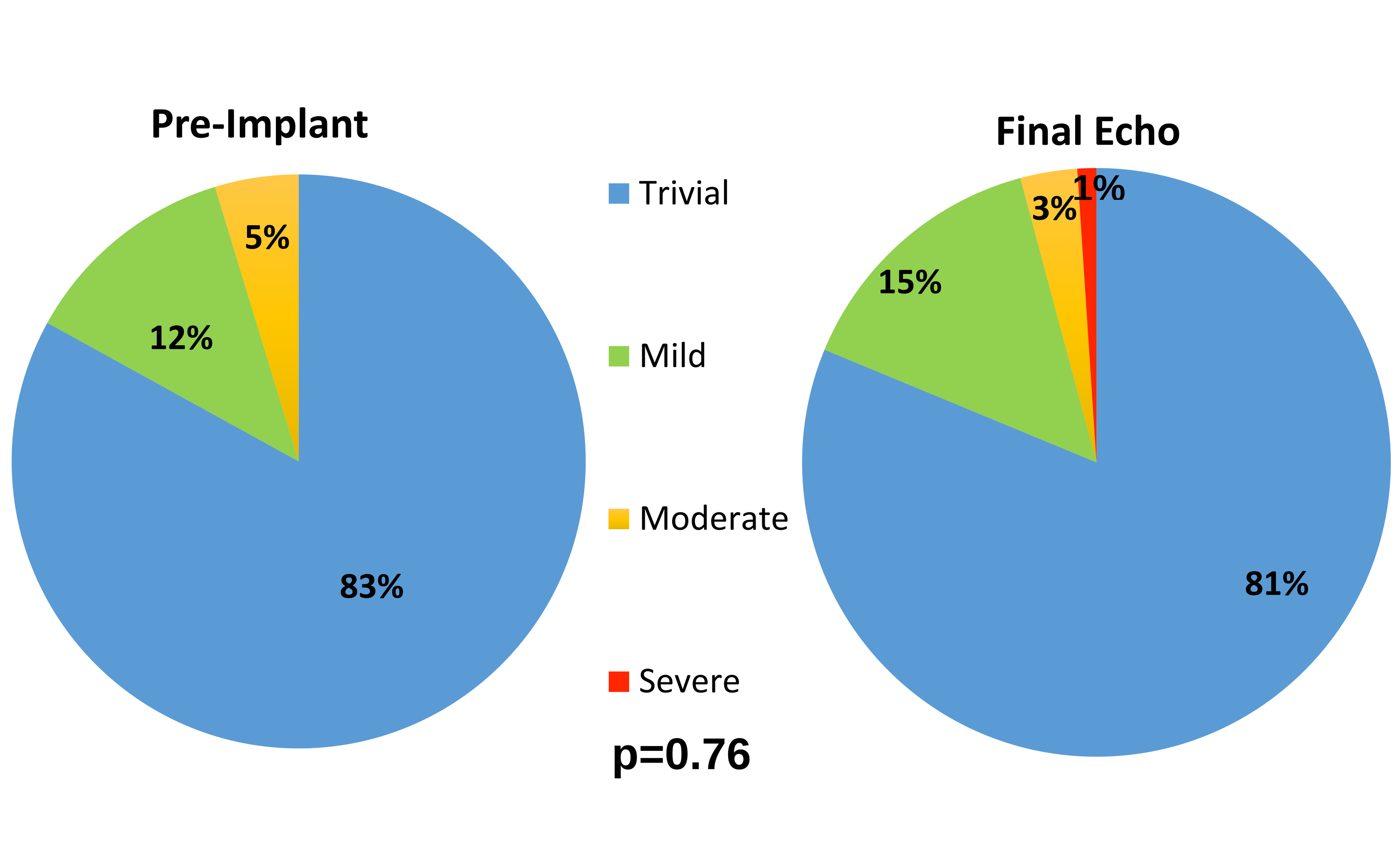
- 146 patients underwent Impella implant. Impella CP support was the most common, followed by Impella 5.0 and Impella 2.5 support.
- Cardiogenic shock was the most common indication for implant.
- Other indications included: bridge to recovery, bridge to transplant/durable device, ECMO with Impella support (ECPELLA), or high risk PCI.
- One patient developed severe AI requiring an AVR (0.68%).
- There was no statistically significant progression of AI before and after Impella use (p=0.76).

Patient Pre-Implant Demographics

Patient Demographics (n=146)	
Female	40 (27.4%)
Age (years)	63.8 ± 12.9
Support days	4.8 ± 5.7
Length of follow up (days)	70.2 ± 190.3
Device Type	
CP	104 (71.2%)
5.0	37 (25.3%)
2.5	5 (3.4%)
Indication	
Cardiogenic shock	94 (64.4%)
Bridge to recovery	57 (39.0%)
Bridge to durable device or transplant	19 (13.0%)
ECMO with Impella support (ECPELLA)	18 (12.3%)
High risk percutaneous coronary intervention	52 (35.6%)

Aortic Insufficiency Analysis

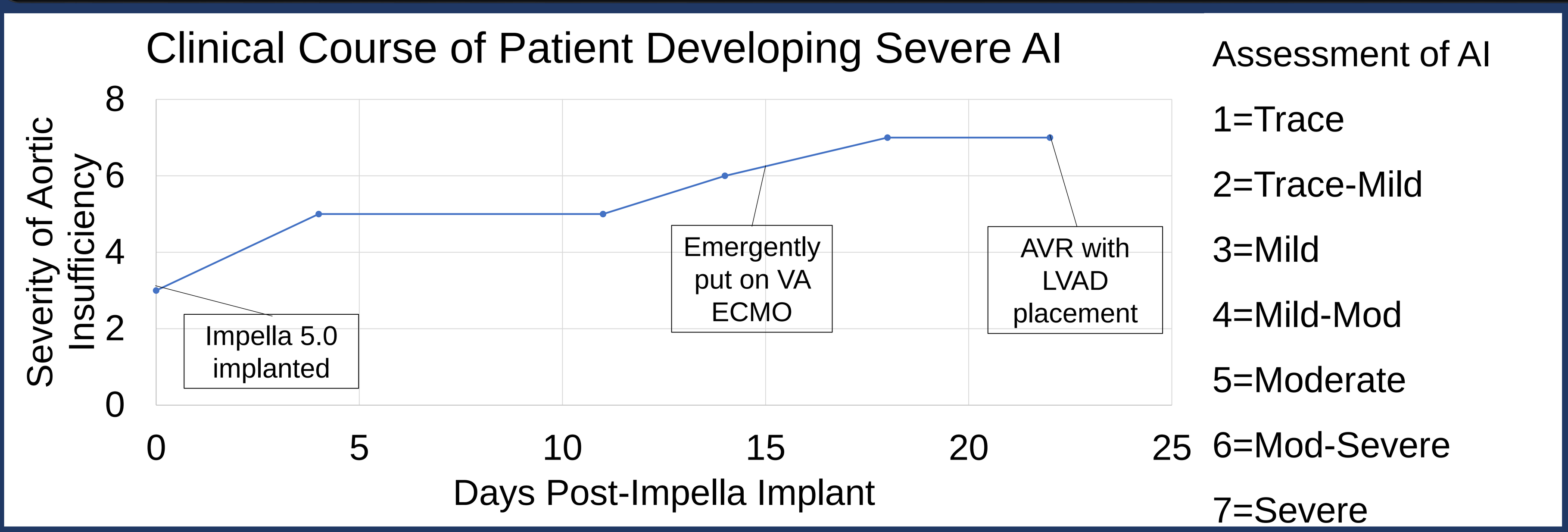
Device	Degree of AI	Pre-Implant (n)	Pre-Implant (%)	Post-Explant (n)	Post-Explant (%)
Total Impella	Trivial	88	83.0	78	81.3
	Mild	13	12.3	14	14.6
	Moderate	5	4.7	3	3.1
	Severe	0	0.0	1	1.0
	Total	106	100	96	100
Impella 5.0	Trivial	32	86.5	21	87.5
	Mild	2	5.4	1	4.2
	Moderate	3	8.1	1	4.2
	Severe	0	0.0	1	4.2
	Total	37	100	24	100
Impella CP	Trivial	56	81.2	57	79.2
	Mild	11	15.9	13	18.1
	Moderate	2	2.9	2	2.8
	Severe	0	0.0	0	0.0
	Total	69	100	72	100



Conclusions

- Analysis of pre-implant and final echocardiograms showed no statistically significant progression of AI during use of Impella devices (p=0.76).
- The patient that developed severe AI requiring AVR was reviewed in detail and determined to be a rare occurrence.
- Although increasing AI post-Impella explant is rare, close patient monitoring and careful follow up is still warranted.

Case Report: Patient Requiring AVR Post-Impella



- 50M, non-ischemic cardiomyopathy, several episodes of ventricular tachycardia, implantable cardioverter defibrillator, and type 2 diabetes
- Implanted with an Impella 5.0 after intra-aortic balloon pump and Impella CP placement due to persistently low CI.
- Emergently put on VA ECMO after Impella purge system malfunction.
- Patient was bridged to BiVAD support with concomitant AVR, and eventual heart transplant.

Disclosure

Dr. Kawabori is a consultant for the Impella 5.5 device.

References

1. O'Neill WW, Kleiman NS, Moses J, et al. A prospective, randomized clinical trial of hemodynamic support with Impella 2.5 versus intra-aortic balloon pump in patients undergoing high-risk percutaneous coronary intervention: the PROTECT II study. *Circulation*. 2012;126(14):1717-1727. doi:10.1161/CIRCULATIONAHA.112.098194

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