Leadless Pacemakers in Post Operative Patients: Is It Time For the New to Become the Normal?

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September 27, 2023

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Invited Editorial: Manuscript ID JCE-23-0567.R2

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Merchant et al. describe a single center retrospective analysis of leadless pacemaker (LP) implant following cardiac surgery or transcatheter valvular procedures that highlights the performance of LPs when implanted in patients with atrioventricular block (AVB) and either high risk features for conventional transvenous pacing or permanent atrial fibrillation (1). LPs performed well with a limited number of patients (7%) requiring conversion to transvenous pacing and only a single procedural complication. However, there was a statistically significant decline in left ventricular ejection fraction (LVEF) in the overall cohort. When subgroup analysis was performed, LVEF decline was only seen in those implanted with VVI devices but not in patients with VDD devices. Here, we discuss implications of this study.

Transcatheter aortic valve implantation (TAVI) is now more common than surgical AVR but carries a greater risk of high degree atrioventricular block (AVB) (˜10%) (2,3). Cardiac surgery has been linked to a 1-3% risk of permanent pacemaker implantation with higher rates in patients undergoing valve replacement (4). Therefore, the number of patients at risk for AVB related to cardiac surgery and catheter-based valve interventions is increasing over time and warrants a critical evaluation of optimal pacing strategy.

Longitudinal registry data show that Micra (Medtronic, Minneapolis, MN) LPs have fewer required reinterventions and chronic complications compared to conventional transvenous pacing systems (5). Furthermore, mortality is comparable despite being implanted in patients with higher rates of end stage renal disease (ESRD) and medical complexity (5). LPs greatly outperform transvenous systems with respect to device related infections, as the rate of infection in LPs is trivial both short and long term (5,6). The risk of pacing induced cardiomyopathy (LVEF drop [?] 10%) in pacemaker dependent patients is suggested to be equivalent or lower in those implanted with an LP (3%) versus those with a transvenous system (˜13%) (7). A major drawback to the use of LPs is their inability to provide atrial pacing, which typically limits their use to patients without sinus node dysfunction.

The current paper demonstrates that the use of LPs is a viable strategy in post-operative patients. Their cohort included 50 patients having undergone cardiac surgery and 28 with a transcatheter valvular procedure (1). Of the 28 transcatheter procedures, 25 were TAVI. Factors prompting an LP implant versus transvenous were permanent AF, ESRD, tricuspid valve pathology, history of endovascular infection, and dermatological disease. Mean time from surgery to device implant was 7.3 ± 8.0 days, which suggests an adequate waiting period for AV conduction recovery in most circumstances. The only complication in the cohort (1.3%) was an access site hematoma requiring evacuation. Device parameters were stable at follow-up with a small but clinically insignificant decline in impedance and trivial rise in threshold, which is consistent with previously published data regarding Micra (6). The two major findings were that the pacing burden declined significantly in the follow-up period and that there was a significant reduction in the left ventricular ejection fraction (LVEF) in this cohort. Pacing percentages fell from mean 75% at implant to mean 48% at follow-up. The reduction in pacing burden suggests that many patients have late recovery in AV conduction post procedure. There was a drop in LVEF from baseline (55.0% ± 10.6%) versus follow-up (51.5% ± 11.2%, p =< 0.001), but this study is not designed to determine if the LVEF drop is because of the Micra or another unidentifiable factor. Importantly, the drop in LVEF was significant in the Micra VR group: baseline (54.1% ± 11.9%) versus follow-up (48.8% ± 11.9%, p = 0.003) but not in the Micra AV group: baseline (56.1 ± 9.0%) versus (54.6% ± 9.7%, p = 0.06). The only patient characteristic that was associated with a significant drop in LVEF (> 10%) versus those with stable EF was having a prior history of heart failure with a reduced ejection fraction. Taken together, this study showed that both Micra AV and VR can provide safe RV pacing in post-operative patients with a small, but significant risk for LVEF reduction that is likely linked to right ventricular pacing.

Benefits

One major benefit of LPs over transvenous systems is the low risk of infection, which is especially important in patients with artificial heart valves. Prosthetic valve endocarditis is the most common form of endocarditis, affecting approximately 4.5% of AVR patients (8). The presence of a cardiac implantable electronic device (CIED) is an independent risk factor (1.6x) for prosthetic valve endocarditis (9). The relationship is likely explained by CIED infection causing bacteremia and seeding of prosthetic valves. Armed with this knowledge, some electrophysiologists are reticent to perform early implantation of a CIED, particularly in post-operative patients who often have indwelling vascular catheters and chest tubes. The current study demonstrates a high rate of late AV recovery, consistent with previously studies that show up to 40% late recovery in AV conduction following valve intervention (10). For those patients with recovery, the ability to program the device "off" obviates the safety issues that can arise in comparison to the unpredictable asynchronous behaviors of a transvenous system at EOL. Thus, LPs could be considered a bridge to AV conduction recovery with a minimal hardware footprint for many of these patients.

Limitations

The best predictor of drop in LVEF within the cohort was a history of heart failure with reduced ejection fraction. Half of the patients with a history of heart failure with reduced ejection fraction (11/22) experienced a drop in LVEF of 10% or more. Thus, these patients would likely be better served with CRT or conduction system pacing unless there is a contraindication to transvenous pacing. LPs could be considered in patients in whom LVEF is expected to recover, but accurate clinical prediction tools for LVEF recovery are lacking and caution should be used. In contrast, the AV MICRA group had a trend towards lower LVEF, it was not clinically meaningful (56.1 vs. 54.6%). While limited, historical data have shown valve intervention may promote restoration of sinus rhythm (11). Thus, based on the likely benefit of maintaining AV synchrony, we suggest preferential use of MICRA AV over MICRA VR unless compelling evidence for permanent atrial fibrillation.

Overall, LPs performed well in this retrospective, single center study of post-operative patients with relatively low rates of reintervention and complications. However, the evidence for drop in LVEF suggests that this patient population would benefit from a prospective study to better understand the net clinical effect of LP vs transvenous pacemaker in this population.

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