



EDITORIAL

Conventional pacing system: It cannot be done better, it can only change

**KEYWORDS**

Complications;
Leadless pacing;
Pacemaker;
Vein anomalies

Since their introduction in the 1960s, pacemakers, the only effective treatment for symptomatic bradycardia, have reduced symptoms and the recurrence of syncope and have improved survival in high-risk populations.

Conventional pacing systems consist of a pacemaker that contains electronics and a battery and is typically implanted in a subcutaneous pocket in the chest. One or more leads thread from the device pocket through the veins and into the heart to conduct the pacing therapy to the desired site. When veins cannot be used, the surgical procedure includes implanting epicardial leads that link the device to the heart.

Steckiewicz et al. aimed to determine the prevalence and variations of persistent left superior vena cava (PLSVC) and to conduct outpatient follow-ups regarding the functioning of the device and the clinical condition of the recipients using data from device placement procedures that were conducted over a 12-year period.¹ Although the prevalence of PLSVC in the population has been reported to be approximately 0.3–0.5%, the prevalence of this systemic vein anomaly was 0.17% in the evaluated patient population (Table 1).¹ This anomaly is usually found incidentally during post-mortem examinations, invasive cardiological procedures, cardio-thoracoscopic procedures or echocardiography.

The presence of PLSVC and its morphology (confluence angles, valves) hinder manipulation of pacemaker leads and placement of leads in the right ventricle, as this situation

requires negotiating the acute angle between the orifice of the coronary sinus and the tricuspid valve. Most importantly, the outpatient follow-ups in the seven patients diagnosed with PLSVC, as well as the assessments conducted at these follow-ups, confirmed normal pacing parameters and lead placements.

Based on the above data, the assumption was made that there were no cases where epicardial leads had to be used to ensure cardiac pacing. There was also no report on the incidence of peri- or post-procedural complications in the evaluated population, irrespective of venous anomalies. It is possible that complications have been greatly reduced in recent years because of technological advances. However, serious adverse events can still occur and have been reported at a rate of 20% 5 years after the procedure, with the most common complications involving the pacing lead (11%) and pocket (8%) (Table 1).^{2–4} The most common complications also include pneumo- or hemothorax after subclavian vein puncture, pocket hematoma, erosion or infection, vein stenosis or occlusion, endocarditis, tricuspid valve trauma, connection troubles, and lead fractures, along with other less common malfunctions.

It is the post-procedural complications, rather than the venous anomalies, that have urged advances toward the present and future transcatheter pacing systems, such as miniaturized pacemaker systems that can be delivered via catheter through the femoral vein and implanted directly into the heart. This new technology eliminates the need for a device pocket and the need to insert a pacing lead, thereby eliminating two main sources of complications

Table 1 The incidence of peri- and post-procedural complications that are related to transvenous pacing systems.

Persistent left superior vena cava (literature)	0.3–0.5%
Persistent left superior vena cava (current study)	0.17%
Pacing lead related complications at 5 years	11%
Pocket related complications at 5 years	8%

Peer review under responsibility of Hellenic Cardiological Society.

<http://dx.doi.org/10.1016/j.hjc.2016.04.003>

1109-9666/© 2016 Hellenic Cardiological Society. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

associated with traditional pacing systems while still providing similar benefits.

References

1. Steckiewicz R, Kosior DA, Rosiak M, Świętoń E, Stolarz P, Grabowski M. The prevalence of superior vena cava anomalies as detected in cardiac implantable electronic device recipients at a tertiary cardiology centre over a 12-year period. *Hellenic Journal of Cardiology*. 2016;57:101–106.
2. Udo EO, Zuithoff NPA, van Hemel NM, et al. Incidence and predictors of short- and long-term complications in pacemaker therapy: the FOLLOWPACE study. *Heart Rhythm*. 2012;9:728–735.
3. Kirkfeldt RE, Johansen JB, Nohr EA, Jørgensen OD, Nielsen JC. Complications after cardiac implantable electronic device implantations: an analysis of a complete, nationwide cohort in Denmark. *Eur Heart J*. 2014;35:1186–1194.
4. Johansen JB, Jørgensen OD, Møller M, Arnsbo P, Mortensen PT, Nielsen JC. Infection after pacemaker implantation: infection rates and risk factors associated with infection in a population-based cohort study of 46299 consecutive patients. *Eur Heart J*. 2011;32:991–998.

Dimitris Tsiachris*

*First Department of Cardiology, University of Athens
Medical School, Hippokration Hospital, Greece*

*Athens Heart Center, Athens Medical Center, Athens,
Greece*

Dimitris Tousoulis

*First Department of Cardiology, University of Athens
Medical School, Hippokration Hospital, Greece*

*Corresponding author. Dimitris Tsiachris, 144 Marathonodromou Street, Marousi 15125, Athens, Greece. Tel.: +30 6944849926, fax: +30 2106862584.

E-mail address: dtsiachris@yahoo.com (D. Tsiachris)