

Temporary Endocavitary Pacemakers and their Use and Misuse: the Least is Better

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ABSTRACT: Temporary pacemakers are classically indicated for severe bradydysrhythmia, especially when the clinical settings require prompt intervention. Implantation of a temporary pacemaker is not a benign procedure since it may be associated with serious adverse events such as infection, cardiac perforation, and lead dislodgment. Accordingly, we recommend, when the clinical condition allows, to proceed directly with permanent pacemaker implantation without prior use of a temporary pacemaker. However, if a temporary pacemaker is required, it should be maintained for the shortest time possible. This policy allows avoiding or decreasing the potential complications associated with temporary pacemaker implantation.

KEYWORDS: temporary pacemakers, infections, dislodgment, emergency

CITATION: Kossaify A. Temporary Endocavitary Pacemakers and their Use and Misuse: the Least is Better. *Clinical Medicine Insights: Cardiology* 2014;8 9–11 doi: 10.4137/CMC.S13272.

RECEIVED: September 22, 2013. **RESUBMITTED:** November 11, 2013. **ACCEPTED FOR PUBLICATION:** November 19, 2013.

ACADEMIC EDITOR: Thomas E. Vanhecke, Editor in Chief

TYPE: Perspective

FUNDING: Author discloses no funding sources.

COMPETING INTERESTS: Author discloses no potential conflicts of interest.

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Introduction

Temporary transvenous endocardial pacing was first introduced by Furman in 1958¹; since then, there is a trend toward an increased use of temporary pacing, mostly in the elderly.² However, temporary pacemaker (TPM) procedures are sometimes associated with significant morbidity and mortality, and, accordingly, TPM implantation should be an evidence-based indication for a judicious use in order to avoid the potential risks associated with this procedure. Inappropriate or abusive implementation of TPM procedures implies unnecessary risks such as lead dislodgment or intracardiac infection,³ and, in view of this, direct permanent pacemaker (PPM) implantation without prior use of TPM, when it is feasible, is theoretically a better approach.

Modalities of Temporary Pacing

Temporary pacing can be used via various modalities: transcutaneous, epicardial, or endocavitary.⁴ Epicardial temporary pacing is frequently used in the postoperative phase of cardiac surgery; endocavitary pacing uses a central venous access, most commonly the right femoral vein, and also the internal jugular vein or subclavian vein may be used. Positioning of

the temporary wire is usually guided by fluoroscopy; however, “blind” placement guided only by electrocardiogram has been described.⁵

Technical Components and Function of Temporary Pacing

A temporary pacemaker is formed from a temporary wire and an external generator. The most commonly used mode is VVI (ventricular inhibited); however, atrio-ventricular dual chamber or even biventricular temporary pacemakers are sometimes used especially in patients with hemodynamic compromise.^{6,7} A variety of catheter types and pulse generators are available. With single chamber pacemakers, there are classically 3 modifiable parameters: heart rate, sensitivity, and output. With dual chamber devices, the AV delay also can be adjustable, and the mode can be changed.⁶

Potential Complications of Temporary Pacing

TPM implantation is not a benign procedure since it may be associated with significant morbidity and mortality.³ Complications may consist of minor incidents such as hematoma, peripheral nerve injury and pain, lead dislodgment, coronary



sinus dissection, and benign drug reaction; however, more serious reactions may consist of severe valvular injury, cardiac perforation, hemothorax, arteriovenous fistula, tamponade, phlebitis, pulmonary embolus, lead dislodgment with loss of capture, device-related infection, cardiac arrest, and death.

Appropriate Use and Misuse

TPM implantation allows urgent pacing intervention; it is useful when early and prompt cardiac pacing is required. Classical indications of TPM consist mainly of advanced atrio-ventricular block, severe and symptomatic bradycardia (BDR), malignant arrhythmia induced by a long QT interval or severe bradycardia, and prophylactic bridging during PPM replacement in dependent patients.³ Moreover, TPM placement is appropriate when the clinical condition requires pacing, while the indication of PPM is still not quite established.

TPM is misused when the implantation can be avoided such as when pacing indication does not conform to guidelines and the clinical condition simply does not require pacing, whether TPM or PPM. In all cases—given the potential risks of temporary pacing—TPM implantation is considered abusive when PPM can be implanted directly with reasonable delay without endangering the patient's life.

It is worth mentioning that placement of a temporary lead connected to an external pacemaker in totally dependent patient is hazardous; lead dislodgment and/or external pacemaker dysfunction (disconnection, accidental mishandling) may lead to cardiac arrest in such cases.^{3,8} Temporary pacing is classically used for short periods; however, when pacing is required for a long-term period (ie, in case of pocket infection in dependent patients), the use of active fixation leads externalized and connected to a reusable permanent pacemaker is a feasible and safe technique.⁹

TPM is indicated in any clinical condition during which temporary pacing may be required, such as in critically ill patients with secondary BDR, in patients with drug-related BDR or during the perioperative period in patients at risk of BDR.^{10,11} These specific settings represent probably the most judicious use of TPM.

Nonetheless, TPM implantation carries significant morbidity and mortality risks, and, in view of this, it is abusive to implement such procedures unless the expected benefit is considered superior to the potential risks. Cardiac perforation, infection, and lead dislodgment in dependent patients represent serious adverse events, and, accordingly, TPM implantation must be avoided when prompt PPM implantation is feasible instead.^{3,12}

Discussion

TPM implies a whole process, from the indication and the implantation procedure until removal of the pacing material. The risk of cardiac perforation associated with TPM is relatively low (~0.34%) but may lead to serious consequences including cardiac tamponade and death.¹³ Inappropriate maneuvering of the temporary lead predisposes to cardiac perforation;

moreover, steroid use and acute right ventricular infarction are risk factors for perforation, and, therefore, TPM placement must be avoided in these settings unless it is essential.^{12,13}

TPM is an established risk factor for early or late intracardiac infection, with an incidence up to 10%,^{14,15} and this represents a serious and potentially lethal complication. When infection occurs late after PPM implantation, this requires removal of all foreign materials with long-term antibiotherapy. The risk of infection related to TPM may be particularly significant when the temporary leads are reused (resterilized). Reused leads imply not only an infectious concern, but also a traumatic risk due to remodeling and rigidity of the lead tip predisposing to ventricular perforation.

Due to diversity in clinical practice and according to local regulations, TPM placement is sometimes performed by cardiology fellows or emergency physicians, who do not necessarily have enough expertise in cardiac pacing.¹⁶ Such clinical practice may represent “endangered or endangering practice,”¹⁷ and, therefore, appropriate clinical governance is essential to formally train emergency physicians or fellows to TPM procedures.

Dislodgment of the temporary lead is a relatively frequent complication that occurs in nearly 11% of cases.^{3,18} Also, some patients may be confused and agitated due to transient brain anoxia that occurred during the BDR episode, and, accordingly, the risk of inadvertent lead dislodgment is relatively significant in these cases. Lead dislodgment in totally dependent patients exposes them to the risk of sudden cardiac death; moreover, temporary ventricular pacing may suppress any underlying ventricular escape rhythm, and, therefore, it predisposes to cardiac arrest in case of lead dislodgment. Of note, excessive use of isoprenaline during the “PPM waiting period” may trigger malignant ventricular arrhythmias exposing patients to the risk sudden cardiac death.¹⁸

After placement of TPM, nursing awareness and expertise is essential; the attending nurse must be capable of diagnosing capture and sensing defects. Also, the nurse must take care of the insertion site.^{19,20} Careful handling of the external pacemaker is essential given that any inadvertent manipulation may result in pacing failure (eg, wire disconnection). Initial programming of the TPM must conform to the patient condition, and subsequent parameter adjustment is essential to adapt to the progression of the condition. Not only pacing defects may be catastrophic, but also sensing loss may result in R/T phenomenon, which may trigger malignant ventricular arrhythmias.²¹

Conclusion

The procedure of TPM implantation has to be well established and standardized in every health care institution, including the indication, the expertise of the operators, the implantation technique, device programming, the quality of the implanted material, and the postprocedural care and associated nursing expertise. After TPM implantation, extended



waiting for a PPM is a recognized hazard and is associated with increased risks of adverse events.¹⁸ In all cases, and when the clinical condition allows, prompt PPM implantation is preferred without bridging with a TPM, especially when the indication of PPM is definitely established. TPM use should be considered only when the clinical condition does not allow a direct use of PPM. When it comes to TPM, the least is better, and when TPM has to be performed, it should be considered as a life saving approach (ie, “do or die”).²²

Author Contributions

Conceived the concept: AK. Analyzed the data: AK. Wrote the first draft of the manuscript: AK. Made critical revisions: AK. The author reviewed and approved of the final manuscript.

DISCLOSURES AND ETHICS

As a requirement of publication the author has provided signed confirmation of compliance with ethical and legal obligations including but not limited to compliance with ICMJE authorship and competing interests guidelines, that the article is neither under consideration for publication nor published elsewhere, of their compliance with legal and ethical guidelines concerning human and animal research participants (if applicable), and that permission has been obtained for reproduction of any copyrighted material. This article was subject to blind, independent, expert peer review. The reviewers reported no competing interests.

REFERENCES

1. Furman S, Robinson G. The use of an intracardiac pacemaker in the correction of total heart block. *Surg Forum*. 1958;9:245–8.
2. Jou YL, Hsu HP, Tuan TC, et al. Trends of temporary pacemaker implant and underlying disease substrate. *Pacing Clin Electrophysiol*. 2010;33:1475–84.
3. López Ayerbe J, Villuendas Sabaté R, García García C, et al. Temporary pacemakers: current use and complications. *Rev Esp Cardiol*. 2004;57:1045–52.
4. Arilla Iturri S, Artázcoz Artázcoz MA. External temporary pacemakers. *Rev Enferm*. 2008;31:54–7.
5. Jafri SM, Kruse JA. Temporary transvenous cardiac pacing. *Crit Care Clin*. 1992;8:713–25.
6. Moungey SJ. Temporary A-V sequential pacemakers. Programming and troubleshooting. *Prog Cardiovasc Nurs*. 1989;4:49–60.
7. García-Bengochea JB, Fernández AL, Calvelo DS, Escudero JA, Gude F, Juanatey JR. Temporary epicardial left ventricular and biventricular pacing improves cardiac output after cardiopulmonary bypass. *J Cardiothorac Surg*. 2012;7:113.
8. Austin JL, Preis LK, Crampton RS, Beller GA, Martin RP. Analysis of pacemaker malfunction and complications of temporary pacing in the coronary care unit. *Am J Cardiol*. 1982;49:301–6.
9. Chihrin SM, Mohammed U, Yee R, et al. Utility and cost effectiveness of temporary pacing using active fixation leads and an externally placed reusable permanent pacemaker. *Am J Cardiol*. 2006;98:1613–5.
10. Bogár L, Csontos C. Indications for peri-operative temporary pacemakers. *Orv Hetil*. 2002;143:1866–1867; author reply 1867–8.
11. Timothy PR, Rodeman BJ. Temporary pacemakers in critically ill patients: assessment and management strategies. *AACN Clin Issues*. 2004;15:305–25.
12. Mahapatra S, Bybee KA, Bunch TJ, et al. Incidence and predictors of cardiac perforation after permanent pacemaker placement. *Heart Rhythm*. 2005;2:907–11.
13. Aliyev F, Celiker C, Türkoğlu C, Karadağ B, Yıldız A. Perforations of right heart chambers associated with electrophysiology catheters and temporary transvenous pacing leads. *Türk Kardiyol Dern Ars*. 2011;39:16–22.
14. Beery TA, Baas LS, Hickey CS. Infection precautions with temporary pacing leads: a descriptive study. *Heart Lung*. 1996;25:182–9.
15. Klug D, Balde M, Pavin D, et al. PEOPLE Study Group. Risk factors related to infections of implanted pacemakers and cardioverter-defibrillators: results of a large prospective study. *Circulation*. 2007;116:1349–55.
16. Harrigan RA, Chan TC, Moonblatt S, Vilke GM, Ufberg JW. Temporary transvenous pacemaker placement in the Emergency Department. *J Emerg Med*. 2007;32:105–11.
17. Sharma S, Sandler B, Cristopoulos C, Saraf S, Markides V, Gorog DA. Temporary transvenous pacing: endangered skill. *Emerg Med J*. 2012;29:926–7.
18. Risgaard B, Elming H, Jensen GV, Johansen JB, Toft JC. Waiting for a pacemaker: is it dangerous? *Europace*. 2012;14:975–80.
19. Overbay D, Criddle L. Mastering temporary invasive cardiac pacing. *Crit Care Nurse*. 2004;24:25–32.
20. Eiken F. How to care for patients with temporary cardiac pacemakers. *Adv Clin Care*. 1989;4:18–22.
21. Chemello D, Subramanian A, Kumaraswamy N. Cardiac arrest caused by undersensing of a temporary epicardial pacemaker. *Can J Cardiol*. 2010;26:e13–4.
22. Agoglia RV, Fazzi RA. Customer service excellence: do or die. *Caring*. 1997;16:14–15.