International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Left Bundle Branch Pacing in a Scoliosis Patient with Symptomatic Bradyarrhythmia: A Case Report

Dilip Kumar[1], Animesh Mishra[2], Rabin Chakraborthy[3], Sanjeev Mukherjee[4], Sanjeev Kathuria[5], Arunkumar Gunasekaran[6], Pinak Pani Das[7], Amit Malviya[8]

[1]DM, Department of Cardiology, Medical Institute of Cardiac Sciences, Kolkata, West Bengal, India

[2]DM, Professor, Department of Cardiology, North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences, Mawdiangdiang, Shillong, Meghalaya, India

[3]DNB, Professor, Department of Cardiology, Medical Institute of Cardiac Sciences, Kolkata, West Bengal, India

[4]DM, Department of Cardiology, Medical Institute of Cardiac Sciences, Kolkata, West Bengal, India

[5] DM, Department of Cardiology, GovindBallabh Pant Hospital Institute of Postgraduate Medical Education and Research, Delhi, India

[6] MD, Department of Cardiology, North Eastern Indira Gandhi Regional Institute of Health And Medical Sciences, Mawdiangdiang, Shillong, Meghalaya, India

[7] MD, Department of Cardiology, North Eastern Indira Gandhi Regional Institute of Health And Medical Sciences, Mawdiangdiang, Shillong, Meghalaya, India

[8] DM, FACC, FSCAI, Department of Cardiology, North Eastern Indira Gandhi Regional Institute of Health And Medical Sciences, Mawdiangdiang, Shillong, Meghalaya, India
Corresponding Author Email ID: *dramit_malviya[at]rediffmail.com*

Running Title: *Scoliosis patient presenting with symptomatic left bundle branch block with 2:1 AV block treated with left bundle pacing*

Abstract: ***Right ventricle (RV) has been the preferred site for pacing in symptomatic brady-arrhythmia. It has also been one of the sites of pacing in cardiac resynchronization therapy. However various studies have demonstrated the deleterious effects of chronic RV pacing. To ameliorate these effects, novel pacing strategy called the physiological pacing has come up where His bundle or Left bundle branch area is paced directly with pacing leads. This method, however, requires precise localization of His bundle, left bundle branch area in interventricular septum and also the normally oriented heart shadow on imaging. Herewith, we are reporting a case of left bundle branch pacing in scoliosis patient with altered radiographic landmarks. The simple maneuvers described here may be useful in reaching the desired pacing site in such cases.***

Keywords: Bradyarrhythmia, RV pacing, His bundle pacing, left bundle branch area pacing, case report

1. Introduction

Traditionally Right Ventricle has been the preferred site of pacing for the management of symptomatic brady-arrhythmias. The deleterious effects of chronic RV pacing in the form of atrial arrhythmias, left ventricular dysfunction and recurrent heart failure hospitalization have been shown by several studies [1]. This has generated interest into a novel pacing strategy called physiological pacing wherein the His bundle or the left bundle is paced directly with 4.1 F pacing lead. Although there are studies demonstrating clinical benefits of permanent His-bundle pacing (HBP), at the same time there are concerns regarding higher pacing thresholds, smaller R-wave amplitudes, early battery depletion and the potential to develop distal conduction block [2]. Selective left bundle pacing can overcome these limitations as it provides excellent threshold with good lead stability [3] especially in patients with infranodalatrioventricular block and left bundle branch block (LBBB). The proximal left bundle branches run through the LV septum and then fan out to form a wider target for pacing compared to the His bundle. During the procedure the radiographic landmarks and intracardiac signals play a major role. We report a case with severe scoliosis of spine and altered radiographic landmarks where the left bundle pacing was done.

2. Case Presentation

A 78 years old female came to us with recurrent episodes ofsyncope over two days. She was non-diabetic, hypertensive for last 15 years on amlodipine 5 mg and was under treatment for ankylosing spondylitis and had severe scoliosis of spine. On examination her heart rate was 55 beats/min, ECG revealed left bundle branch block with QRS duration 158 mSec and intermittent 2:1 atrioventricular block (Fig 1). Echocardiogram revealed an ejection fraction of 45% with global hypokinesia. The blood reports were unremarkable and chest X-ray showed scoliosis of spine. As the patient was having LV systolic dysfunction with LBBB we decided to go for conduction system pacing with recruitment of left bundle branch block.After obtaining

Licensed Under Creative Commons Attribution CC BY

informed consent, procedure was done under local anasthaesia. Twelve lead electrocardiography and intracardiacelectrograms were continuously recorded. At the outset, His location was identified with the help of a quadripolar catheter which was a little superior and medial to the usual location. After obtaining two separate extra thoracic left subclavian venous puncture C315 HIS Sheath was used to map left bundle area. The lumen less 4.1 F 3830 lead was introduced and unipolar mapping was done with the help of EP system. As the His C315 sheath was unable to reach the site of His location, we gave a secondary curve of approx 70 degree in the sheath with the dilator inside as the sheath has a memory of 3 minutes. Even after multiple attempts for long, desired site could not be reached. After multiple maneuvers and 10-12 minutes effort we shifted to left bundle area which could be reached taking the sheath near apex and with little clockwise maneuver pulling along the septum to a higher position. The intracardiac signals were checked during the process at2-3 places and finally we got a desired place for LBB pacing. At this site, we got the W pattern in V1 and aVR,aVL discordant on electrocardiogram. The lead was rotated rapidly 7-8rotationsto get deep into the septum.The impedance dropped to 670 ohms from 1080 ohms and pacing there showed typical RBBB pattern on the electrocardiogram. The paced left ventricular activation time (LVAT in lead V5) was 82mSec.Programmed stimulation also demonstrated the differential capture of left bundle and myocardium. Finally the 3830 lead was secured (Fig 2a, 2b). Subsequently atrial lead was placed at right atrial appendage. Both the leads were connected to a dual chamber pulse generator.ECG following the lead placement demonstrated narrowed QRS complexes (Fig 3).

3. Discussion

Cardiac pacing remains the only effective therapy for symptomatic bradyarrhythmias. As chronic RV pacing has certain significant hemodynamic problems, other alternative pacing sites weretaken under consideration. This includes right ventricular septum, right ventricularoutflow tract and left ventricle. Later, the concept ofpermanent His bundle pacing was developed by Desmukh et al [4]. His bundle pacing (HBP) has low sensed R wave amplitude, which might result in atrial over sensing and ventricular undersensing. Because of high pacing thresholds either at the time of implantation or during follow-up there are chances of early battery depletion and pulse generator change in 5%–10% of patients. Subsequently, with further insights into the anatomy of the conductionsystem, selective pacing of the left bundle branch (LBB) wasattempted by Huang et al[3]. In this method, the lead is placed deep into theinterventricular septum with good lead stability and the pacing parameters are good. Advantage of LBBP is that it can correct the distal conductionsystem disease as the pacing lead effectively bypasses the diseased proximal segment [5].Vijayaraman et al demonstrated success rate of 84% for HBP in unselected patients with AV block (93% AV nodal and 76% infranodal) at threshold of 1.3 ± 0.9 V at 0.5 ms with 5% lead revision rate [6]. However, Li et al reported 90% success rate for LBBP patients with AV conduction disease [7]. Left bundle branch pacing (LBBP) is considered to be an alternative to cardiac resynchronization therapy for patients with DCMP (dilated cardiomyopathy) with LV dysfunction and left bundle branch block (LBBB) pattern. Various studies have shown good outcomes in respect to improvement in NYHA functional class and LV ejection fraction [8,9]. Zhang et alshowed resynchronization of ventricular contraction with reverse cardiac remodeling and symptomatically significant improvement after LBBA pacing in patients with heart failure with reduced ejection fraction and LBBB [10]. In a large multicentered retrospective study by Vijayaraman et al assessed the feasibility and outcomes of LBBP in CRT eligible patients. It was found that,CRT could be successfully achieved by LBBP with 85% success rate including 44% of ischemiccardiomyopathy patients.LBBP resulted insignificant reduction in QRS duration, improvement in LVEF in both ischemic and nonischemic patients and equally in patients with LBBB and non-LBBB. The lead threshold and R wave amplitude remained stable during follow-up period. It was noted that, 72% ofpatients improved clinically by atleast one in NYHA functional class. Echocardiographic improvement (defined as ≥5% increase in LVEF) was found in 73% of patients [11].

Anatomy of heart may be different in various patients due to vertebral disorders and distorted cardiac position. Our case is an example and demonstration that even in difficult anatomy of severe scoliosis of spine it can be done with existing hardwares with changing the curve and doing some maneuvers. In our experience of 48 cases at our centre, the two failed cases were aged more than 80 yrs old indicating that the distorted orientation which we see in elderly people may be a important factor in placement of leads .The tools and kits for this procedure have to be further refined in order to make this procedure more usable in all anatomies and bringing down the failure rate. There is no previous report of LBBA pacing in such anatomy in literature and by far this is the first reporting of case of LBB pacing in distorted cardiac orientation.

Declaration of conflict of interest: The authors declare that there is no conflict of interest.

Disclosure: none, no relationship to industry

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Contributorship: All authors were involved in patient care , drafting and editing of the manuscript .

Data availability statement: The data underlying this article are available in the article and in its online supplementary material.

References

[1] Wilkoff BL, Cook JR, Epstein AE, Greene HL, Hallstrom AP, Hsia H, Kutalek SP, Sharma A. Dual-chamber pacing or ventricular backup pacing in patients with an implantable defibrillator: the Dual

Licensed Under Creative Commons Attribution CC BY

Chamber and VVI Implantable Defibrillator (DAVID) Trial. Jama. 2002 Dec 1; 288(24):3115-23.
[2] Subzposh FA, Vijayaraman P. Long-term results of His bundle pacing. Cardiac electrophysiology clinics. 2018 Sep 1; 10(3):537-42.
[3] Huang W, Su L, Wu S, Xu L, Xiao F, Zhou X, Ellenbogen KA. A novel pacing strategy with low and stable output: pacing the left bundle branch immediately beyond the conduction block. Canadian Journal of Cardiology. 2017 Dec 1; 33(12):1736-e1..
[4] Deshmukh P, Casavant DA, Romanyshyn M, Anderson K. Permanent, direct His-bundle pacing: a novel approach to cardiac pacing in patients with normal His-Purkinje activation. Circulation. 2000 Feb 29;101(8):869-77.
[5] Vijayaraman P, Cano O, Koruth JS, Subzposh FA, Nanda S, Pugliese J, Ravi V, Naperkowski A, Sharma PS. His-Purkinje conduction system pacing following transcatheter aortic valve replacement— feasibility and safety. JACC ClinElectrophysiol. 2020 June; 6(6):649-657.
[6] Vijayaraman P, Naperkowski A, Ellenbogen KA, Dandamudi G. Electrophysiologic insights into site of atrioventricular block: lessons from permanent His bundle pacing. JACC: Clinical Electrophysiology. 2015 Dec;1(6):571-81.
[7] Li X, Li H, Ma W, Ning X, Liang E, Pang K, Yao Y, Hua W, Zhang S, Fan X. Permanent left bundle branch area pacing for atrioventricular block: feasibility, safety, and acute effect. Heart rhythm. 2019 Dec 1;16(12):1766-73.
[8] Zhang W, Huang J, Qi Y, Wang F, Guo L, Shi X, Wu W, Zhou X, Li R. Cardiac resynchronization therapy by left bundle branch area pacing in patients with heart failure and left bundle branch block. Heart Rhythm. 2019 Dec 1; 16(12):1783-90.
[9] Huang W, Wu S, Vijayaraman P, Su L, Chen X, Cai B, Zou J, Lan R, Fu G, Mao G, Ellenbogen KA. Cardiac resynchronization therapy in patients with nonischemic cardiomyopathy using left bundle branch pacing. Clinical Electrophysiology. 2020 Jul 1; 6(7):849-58.
[10] Zhang J, Wang Z, Cheng L, Zu L, Liang Z, Hang F, Wang X, Li X, Su R, Du J, Wu Y. Immediate clinical outcomes of left bundle branch area pacing vs conventional right ventricular pacing. Clinical cardiology. 2019 Aug;42(8):768-73.
[11] Vijayaraman P, Ponnusamy S, Cano Ó, Sharma PS, Naperkowski A, Subsposh FA, Moskal P, Bednarek A, Dal Forno AR, Young W, Nanda S. Left bundle branch area pacing for cardiac resynchronization therapy: results from the international LBBAP Collaborative Study Group. JACC: Clinical Electrophysiology. 2021 Feb 1;7(2):135-47.

Figure legends:
Fig 1: Baseline ECG of patient showing LBBB with wide QRS (158 msec) and 2:1 AV block
Fig 2 (a): lead positions in LAO 30 degree view
Fig 2 (b) Lead positions in anteroposterior view. Note the vertebral curvature due to severe scoliosis.
Fig 3: Post-procedure ECG with magnet showing narrowed QRS (120 ms)

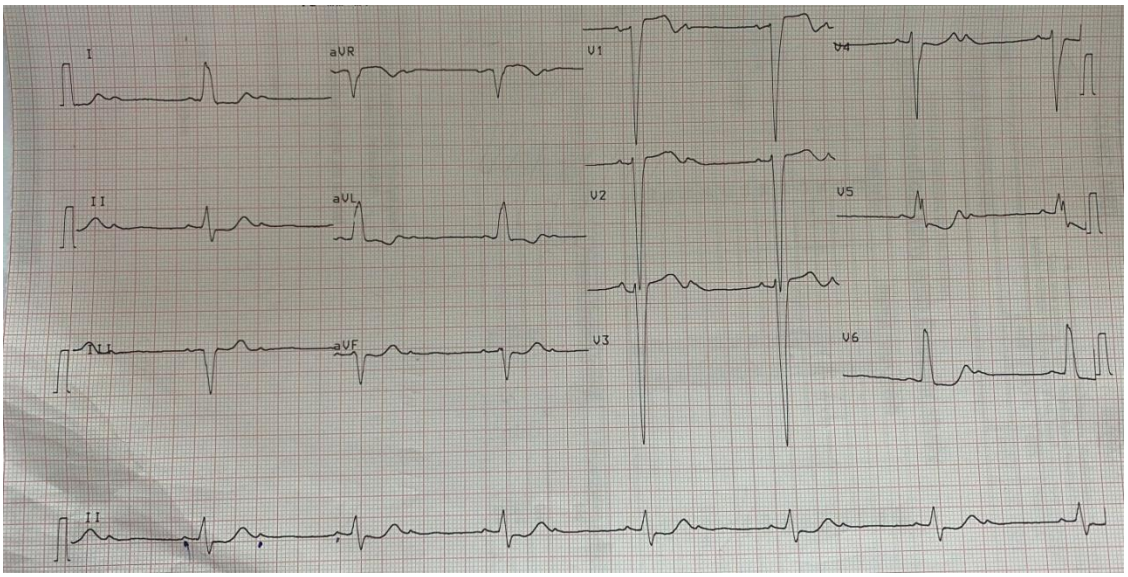

Figure 1: Baseline ECG of patient showing LBBB with wide QRS (158 msec) and 2:1 AV block

Licensed Under Creative Commons Attribution CC BY

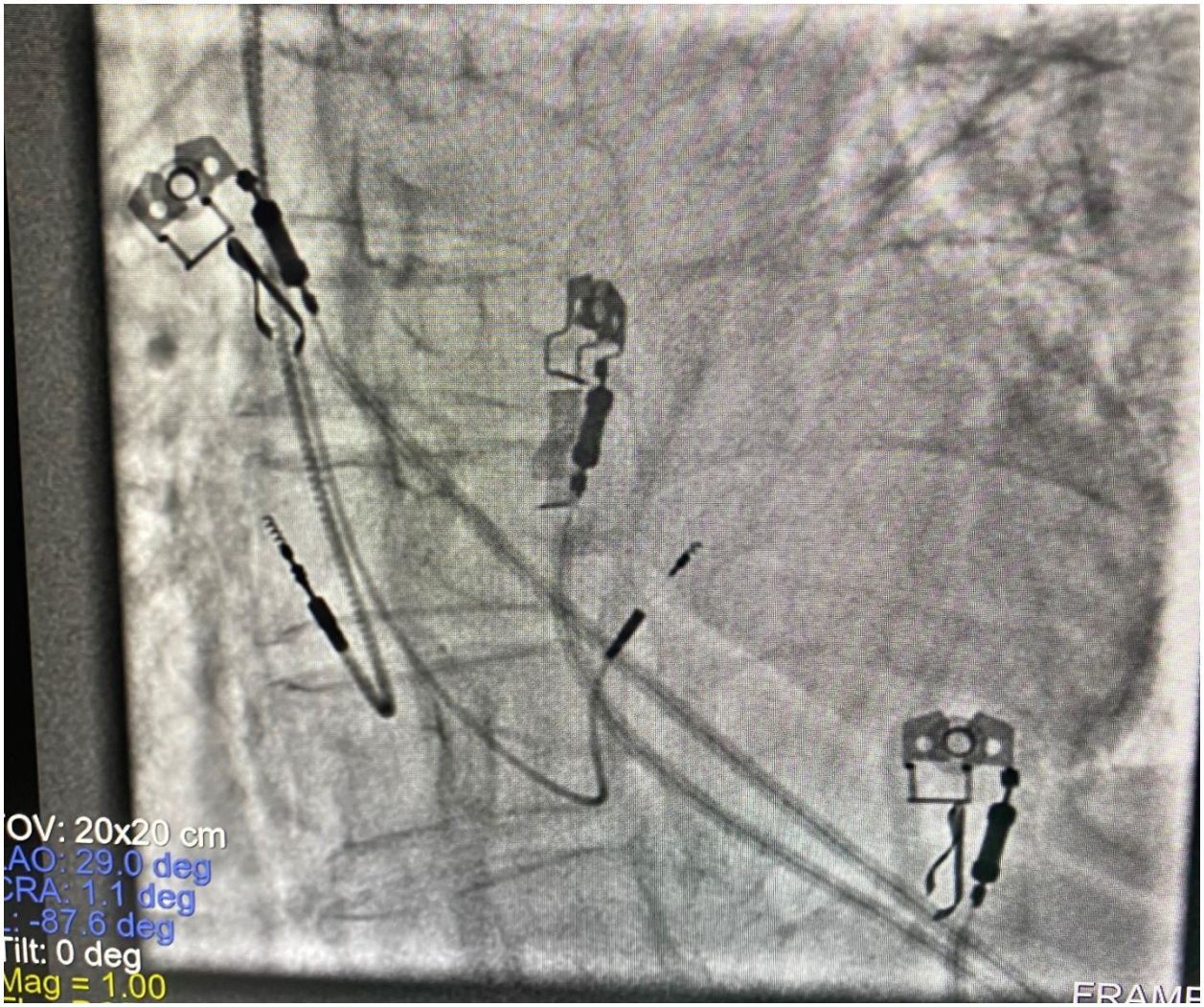

Figure 2(a): lead positions in LAO 30 degree view

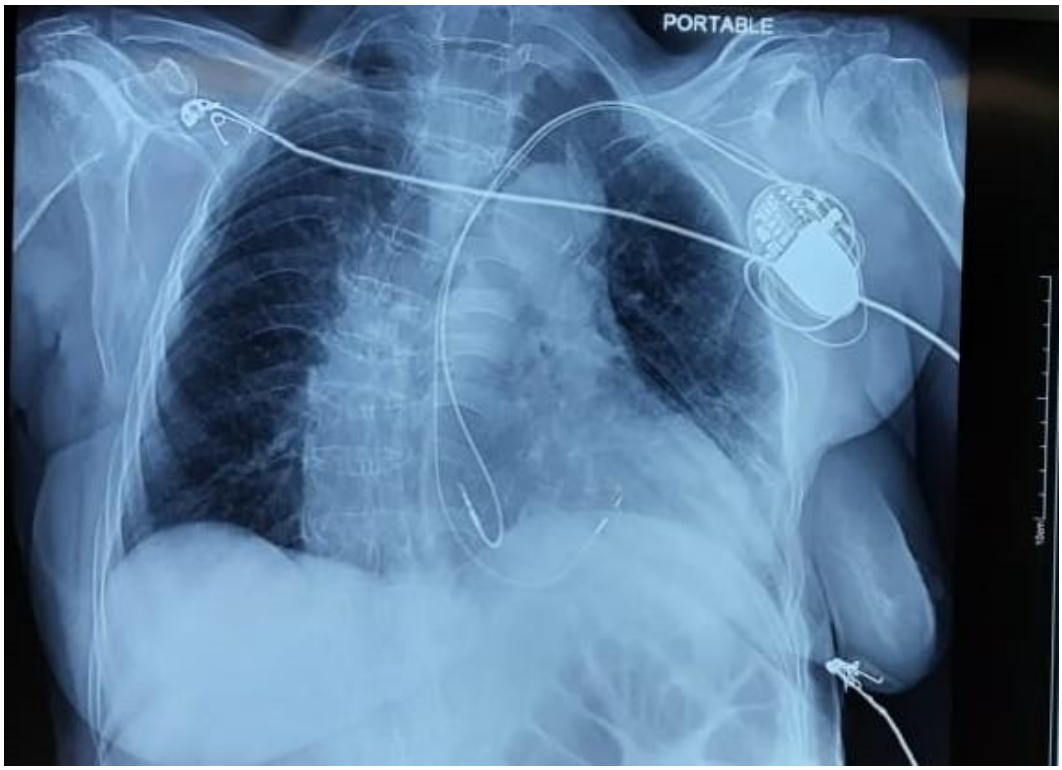

Figure 2(b): Lead positions in anteroposterior view. Note the vertebral curvature due to severe scoliosis.

Licensed Under Creative Commons Attribution CC BY

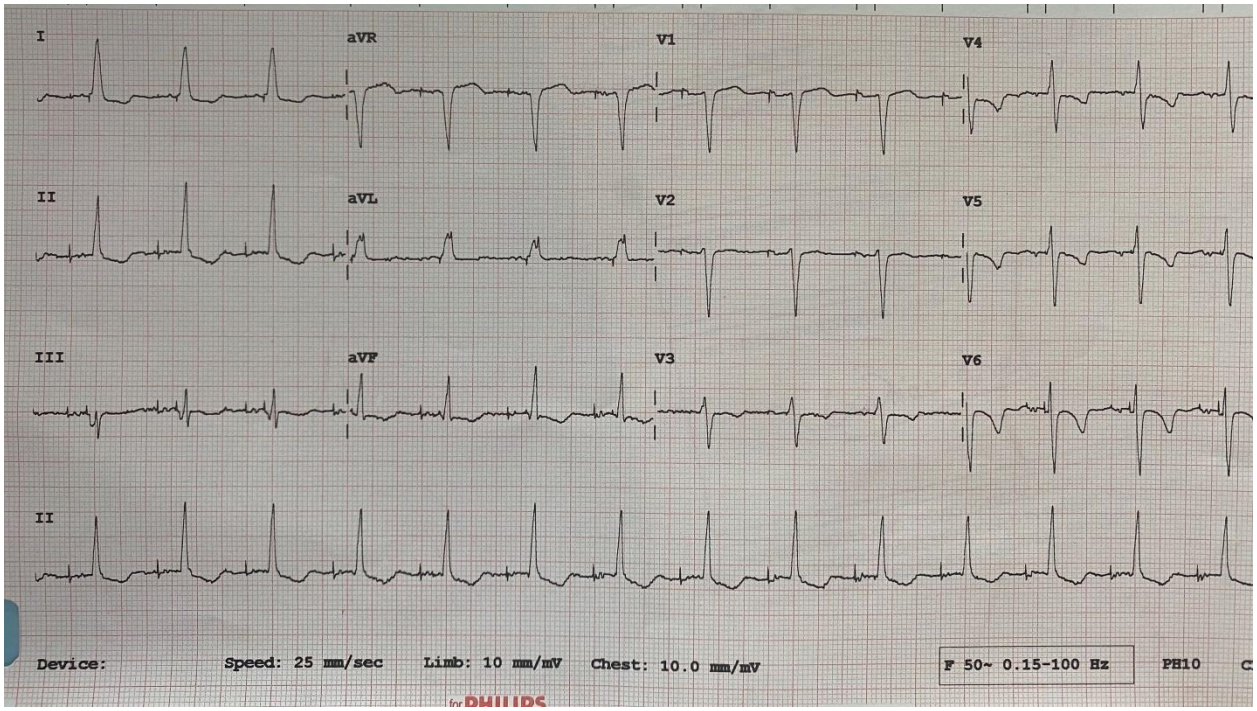

Figure 3: Post-procedure ECG with magnet showing narrowed QRS (120 ms)

Licensed Under Creative Commons Attribution CC BY