

LEARNING CORNER



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12-LEAD ELECTROCARDIOGRAM - A VALUABLE TOOL IN TEMPORARY CARDIAC PACING MANAGEMENT

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SUMMARY

Inadvertent malposition of pacing leads is a recognized complication of temporary cardiac pacing procedure, which can be fatal particularly if lead placement is in the left ventricular (LV) cavity because of the risk of thromboembolic events.¹ Malposition leads can be either due to unrecognized congenital heart defects including atrial or ventricular septal defects, patent foramen ovale or due to iatrogenic perforation of interventricular septum but sometimes it may be due to faulty insertion via trans-arterial instead of trans-venous access.²

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CLINICAL VIGNETTE

A 47 years old female had a syncopal episode while she was working in her house. She also had pre syncopal episodes in recent past. She had no other comorbidities. Her attendants took her to nearby hospital where her electrocardiogram showed complete heart block with ventricular escape rate of 46/min. Her physical examination was unremarkable. Doctor on duty placed the temporary pacemaker lead (TPM), after informed consent, via right femoral approach (probably without fluoroscopic guidance). After hemodynamic stabilization she was referred to our cardiology center for further management. We received her in hemodynamically stable condition. There was no temporary pacemaker insertion procedural record available. Her electrocardiogram done at our cardiac centre showed pacing spikes with appropriate capture but with R wave in lead V1 (Figure 1).

This led to the suspicion of malpositioned pacing lead likely in the left ventricle. Patient was directly taken to the pacing lab and under the fluoroscopy the lead was found to be present in the left ventricle via the aorta i.e. right femoral artery was punctured by the first doctor which led the way to the left ventricular cavity (Figure 2 - 3). Anticoagulation was started

immediately. There was no pericardial effusion/TPM lead thrombus observed on echocardiography.

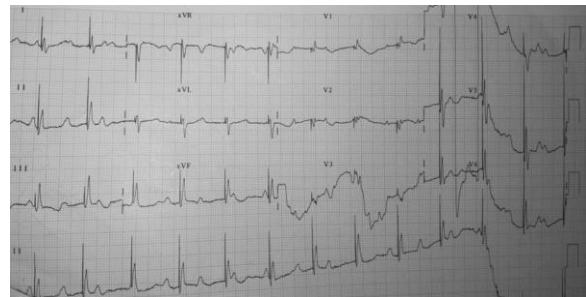


Figure 1: 12- Lead Electrocardiogram (ECG) showing Right Bundle Branch Block (RBBB) Pattern after temporary pacemaker insertion

The patient was pacing dependent with underlying complete heart block. Another TPM lead was inserted under fluoroscopic guidance via right subclavian venous approach to prevent asystole while removing LV TPM lead and manual pressure was applied at the right groin area. Echocardiography review study was performed to rule out pericardial effusion after removing LV TPM lead. Reversible causes of complete heart block were excluded and dual chamber pacemaker was implanted.

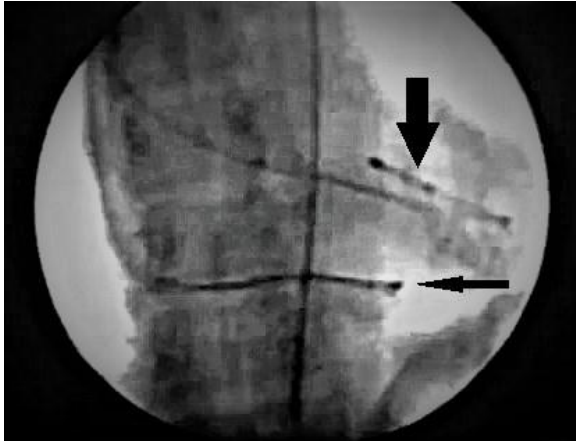


Figure 2: Fluoroscopic view in anteroposterior (AP) projection showing two pacing leads. Thick arrow: Temporary pacing lead accessed via right femoral artery, crossing the aorta and entered into the left ventricular cavity after making a loop in the arch. Thin arrow: Second temporary pacing lead accessed via right subclavian vein and entered into the right ventricular cavity

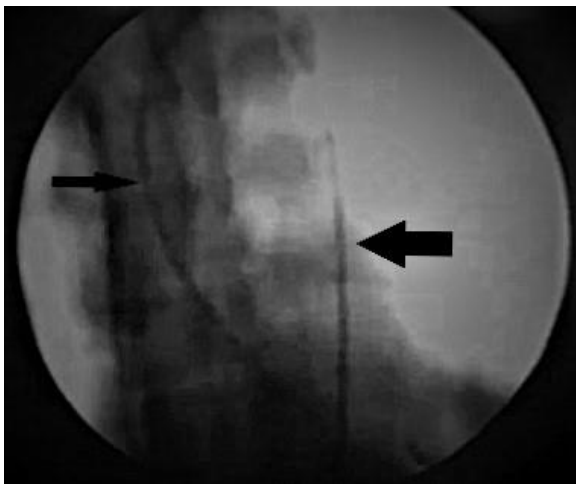


Figure 3: Fluoroscopic view in anteroposterior (AP) projection showing looped pacing lead in the ascending, (Thin Arrow) descending (Thick Arrow) and arch of aorta

DISCUSSION

Temporary cardiac pacing is usually required in life threatening emergencies for appropriate indication and done without fluoroscopy in emergency departments, followed by 12-lead surface electrocardiogram showing left bundle branch block (LBBB) to confirm the placement of pacing lead in right ventricle apex.³ Other modalities to confirm the lead malposition includes chest X-Ray, echocardiography, CT scan and definitely fluoroscopy, when available.⁴ Without fluoroscopic guidance there are more chances of

inadvertent positioning of pacing lead and pacing leads may be found in several places including left ventricle, atria, coronary sinus etc. either due to underlying congenital heart defects, iatrogenic perforation or arterial access instead of venous access.²

In our case, temporary pacemaker was placed in a tertiary care center of a remote area, without fluoroscopic guidance and accidental arterial access was obtained instead of venous access. As fluoroscopy is not available everywhere, transthoracic echocardiography is a feasible and safe option in terms of decreasing procedure-related complications and sparing valuable time for unstable patients. Besides this, post-procedure ECG is very helpful in localizing the position of the pacing lead as right ventricle pacing demonstrates LBBB on ECG almost always with some exceptional cases in which right bundle branch block (RBBB) pattern is observed instead of correct positioning of the pacing lead and it is defined as 'pseudo RBBB' pattern which may be due to underlying right bundle branch diseases or early depolarization of the left ventricle.⁵ This can be corrected sometimes by the placement of leads V1-V2 one interspace lower than standard which results in disappearance of RBBB morphology and appearance of QS or rS pattern in V1-V2.⁴ RBBB pattern on electrocardiography can usually be produced by left ventricular pacing.

Our patient had no post-procedure ECG record with her. ECG that was done at our setup led to the suspicion of inadvertent placement of the pacing lead that has been managed timely. Furthermore, post-procedure chest X-ray could have helped in diagnosing lead malplacement. As in anteroposterior chest X-ray view, the tip of the pacing lead should be visualized slightly to the left of the thoracic spine, at the anterior-inferior aspect of the cardiac shadow. In lateral view, the lead tip should overlay the inferior aspect of the cardiac shadow and point toward the sternum. Echocardiography and CT-Scan can also help in the same manner depending upon their availability and the clinical status of the patient.

These modalities are very helpful in early detection and management of inadvertent lead placement and may help in avoiding life-threatening complications.

LEARNING POINTS

1. Temporary cardiac pacing is a lifesaving procedure in mortal bradyarrhythmias and sometimes for terminating tachyarrhythmias.
2. Unavailability of fluoroscopy in remote areas of developing countries can lead to the inadvertent malposition of pacing leads and put the life of a

patient more at risk in case of any debilitating complications like thromboembolism.

3. Simple and easily available investigations like 12-lead ECG can play a significant role in avoiding such complications.
4. 12-lead ECG with RBBB pattern after temporary pacemaker placement should be evaluated vigilantly before labelling as 'pseudo RBBB pattern'.

QUESTION 1:

Which of the following pacing site/route can give RBBB morphology in lead V₁?

- A. LV endocardial pacing
- B. Coronary sinus branch
- C. RV endocardial pacing
- D. RV pacing with intrinsic RBBB
- E. All of the above

QUESTION 2:

Which one of the following venous access sites is considered most safe for temporary cardiac pacing?

- A. Femoral
- B. Subclavian

- C. Brachial
- D. Internal Jugular
- E. External Jugular

ANSWERS:

Question 1: The correct answer is option E.⁵

Question 2: The correct answer is option D.⁶

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