



## TEMPORARY PACEMAKER INSERTION CAUSING RIGHT VENTRICLE PERFORATION WITH CARDIAC TAMPONADE AND DIAPHRAGMATIC INJURY.

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**ABSTRACT** Cardiac perforation post pacemaker insertion is a rare complication. However, acute right ventricular perforation presenting with hemopericardium leading to cardiac tamponade is a life-threatening condition which may prove fatal without urgent intervention. The diagnosis is based on clinical presentation of the patient post procedure along with chest Xray, Computed tomography (CT) scan and echocardiographic study. Management of the perforation is based on clinical assessment of the patient. Rapidly progressing pericardial effusion or neighbouring organ injury result in haemodynamic instability for which urgent surgical intervention is indispensable.

### KEYWORDS :

#### Introduction

Temporary pacing wire insertion plays a pivotal role in preserving cardiac output until there is resolution of the reversible cause or implant of permanent pacemaker. Cardiac perforation is a rare life-threatening complication of pacemaker or implantable cardioverter defibrillator implantation which happens at the time of insertion. We describe an unusual case of 60-year-old woman following temporary pacemaker insertion presented with acute right atrial and right ventricular perforation along with traumatic injury to the diaphragm.

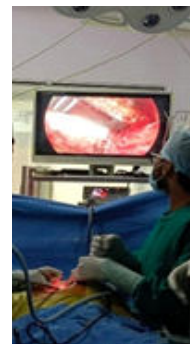
#### Case presentation

A 60-year-old woman with a previous medical history of hypertension, hyperlipidaemia, hypothyroidism on oral hypoglycaemic agents presented to Teerthanker Mahaveer Medical College & Research Centre (TMMC&RC), Hospital Casualty for the progressively worsening shortness of breath and fatigue from the last few days. The patient witnessed an episode of syncope and gave history of increased drowsiness and multiple episodes of similar syncope in the past one year. The vitals of the patient on presentation were as follows: Blood Pressure 100/78 mm Hg, Temperature 97.8°F, Respiratory Rate 24 per min, Pulse of 45 beats per min, and oxygen saturation was 96% on room air. The cardiopulmonary examination was evident of an irregular rhythm with bradycardia. On chest auscultation, there were bilateral basilar crackles with decreased breath sounds. The chest x-ray was indicative of left sided pleural effusion. Electrocardiography (ECG) showed bradyarrhythmia. The transthoracic echocardiogram (TTE) showed reduction in left ventricular systolic function; ejection fraction (EF) of 20-25%; global hypokinesia; and moderate mitral regurgitation. The patient was initially evaluated by cardiologist and after series of resuscitative medications and basic laboratory workup, the patient underwent temporary pacemaker implantation due to significant ventricular pauses with a recommendation to start amiodarone as a temporary antiarrhythmic. However, soon after temporary pacemaker implantation the patient had acute onset severe chest pain with associated shortness of breath. The pacing parameters also deranged for which urgent dual chamber permanent pacemaker placement was attempted. The patient became haemodynamically unstable with systolic blood pressure of 60, pulse 120 beat per minute, and respiratory rate of 32 per minute non responsive to fluid bolus and vasopressor support. Urgent chest x ray was done which indicated migration of tip of the temporary pacemaker implanted. Bedside echocardiographic study indicated increasing pericardial effusion. Following which Cardiothoracic & Vascular Surgery Team was informed. After necessary preoperative workup and taking proper informed and written consent, we shifted the patient to the Operation Theatre(OT) immediately. Using subxiphoid uniport approach Video Assisted Thoracoscopic surgery (VATS) was planned. Intraoperatively, the temporary pacemaker lead was found in abdomen above the right lobe of liver piercing the diaphragm. The temporary pacemaker lead was retracted gradually and removed from the insertion site taking care of preventing any traumatic injury to the vital structures. The permanent pacemaker leads were repositioned to a

slightly different place in the Right Ventricle Apex. Using subxiphoid uniport approach Video Assisted Thoracoscopic surgery (VATS), the perforation sites were repaired using 6-0 prolene. No major vessel trauma was found. The diaphragm perforation site was repaired using 6-0 prolene by Video Assisted Thoracoscopic surgery (VATS). Complete haemostasis was achieved during each step and the patient responded well to the procedure. During the hospital stay repeat Transthoracic Echocardiographic study indicated stable pericardial effusion, ejection fraction of 20%-25%, and normal left ventricle filling pressure. Anticoagulation was started 48 hours post procedure. Amiodarone was continued to the patient. The patient was also started on digoxin. The clinical course was uneventful and the patient was discharged on medications with stable vitals and advice of regular follow-up.



Dr. Ayush Srivastava and Team performing Video Assisted Thoracoscopic Surgery (VATS) subxiphoid uniport approach for the complication of temporary pacemaker implantation leading to right atrium and ventricle perforation followed by diaphragmatic perforation.



Intraoperative picture of Video Assisted Thoracoscopic Surgery (VATS) subxiphoid uniport approach, the temporary pacemaker lead was found in the abdomen perforating the diaphragm.



Intraoperative picture: the silver lead perforating the diaphragm is the temporary pacemaker lead.

### Discussion

Cardiac pacemaker devices are used for temporary as well as permanent management for cardiac conduction abnormalities and arrhythmias. Based on the onset of symptoms the device-related complications are classified into three categories: acute within 24 hours, subacute up to one month, and chronic/delayed after one month. Commonly reported complications are lead malposition, pneumothorax, myocardial perforation, displacement or fracture due to manipulation, infectious complications related to pacemaker pocket infection or endocarditis, lead sensing or pacing failure, lead erosion, and venous thrombosis.

Right ventricular perforation is rare life-threatening complication of implantable cardioverter defibrillator (ICD) pacemakers (PMs) and placement. Various study reveals right ventricular apex to be the most common site of perforation owing to the thin wall. Clinically, patients can remain asymptomatic or present with sharp chest pain, dyspnoea, syncope, abdominal pain, hiccups, and cardiogenic shock due to hemopericardium with cardiac tamponade, pleural effusion, and pacing and sensing failure. Factors associated with cardiac perforation due to pacemaker include temporary leads, steroid use which are known to cause myocardial atrophy, old age, low body mass index, active fixation leads, and concomitant anticoagulation. Right ventricular perforation is less commonly seen with right ventricular hypertrophy. Right ventricular systolic pressure > 35 mm Hg is a protective factor against perforation by leads. Different modalities are used to diagnose device-related complications. The chest x-ray and echocardiogram are non-invasive and easily available bedside modalities to diagnose pacemaker complications, including pericardial or pleural effusion, lead position or displacement and ideal slack. A computed tomography (CT) scan of the chest can be used to confirm pericardial or pleural effusion and lead position or displacement. Device interrogation is very important, as perforation usually result in pacemaker sensing and pacing failure; however, normal pacemaker function does not rule out pacemaker perforation. About the pacing parameters it should be always considered that change in pacing parameters suggest lead dislodgment not necessarily lead perforation, lack of change in pacing parameters does not exclude lead dislodgement or perforation. There are no consistent lead pacing parameters to rule in or out dislodgement or perforation. Once a change in parameter is detected and lead dislodgement is suspected clinicians should immediately proceed to imaging studies to differentiate between perforation and lead dislodgement. The management of pacemaker lead perforation depends upon the clinical presentation, pericardial effusion, and hemodynamic status.

Management strategies include lead repositioning, lead extraction or open-heart surgery. In haemodynamically stable patients, the preferred strategy is percutaneous lead extraction under close echocardiographic or fluoroscopic monitoring with surgical backup. Lead extraction should be followed by the placement of a new lead in a different location, preferably in the right ventricular outflow tract or the interventricular septum. Many case reports describe successful use of fibrin glue patch or cyanoacrylate glue instilled through the pericardial space to seal the perforation site secondary to pacemaker implantation. Urgent surgical management is the recommended treatment in hemodynamically unstable patients presenting with rapidly progressing pericardial effusion with cardiac tamponade, large pleural

effusions with respiratory compromise or injury of the surrounding organs. However, urgent exploration of the extent of the injury and repairing it in haemodynamically unstable patient is essential to prevent mortality. Some studies also suggest that the extraction of a chronically perforated lead without device malfunction nor any resulting symptoms is not mandatory. Video Assisted Thoracoscopic Surgery (VATS) has widely revolutionized the approach and management of many pulmonary and cardiac diseases over the past two decades. Prior to advent of Video Assisted Thoracoscopic Surgery (VATS), the standard approach to thoracic pathology was thoracotomy. The number of Video Assisted Thoracoscopic surgery (VATS) application has escalated over the decades as technological advancements made such procedures safe for elderly and frail patients. Video Assisted Thoracoscopic surgery (VATS) has multiple advantages over traditional thoracotomy including less postoperative pain, shorter hospital lengths of stay, earlier recovery of respiratory function especially in patients with Chronic Obstructive Pulmonary Disease (COPD) and the elderly and overall reduced cost. Any surgical intervention in thorax previously was invasive and required median sternotomy. The wound of median sternotomy added to the misery of the already distressed patient. However, minimally invasive techniques such as subxiphoid uniport approach Video Assisted Thoracoscopic Surgery can be used for the traumatic injuries of the thorax as seen in this case. Additional to the patient's compliance, the patient was discharged early.

### Conclusions

Video Assist Thoracoscopic surgery (VATS) is a minimally invasive surgical technique used to diagnose and treat problems in the chest. Video Assisted Thoracoscopic Surgery (VATS) has replaced open thoracotomies in most thoracic surgery centres around the world because of its safety profile, better pain control, faster recovery times and easier control of bleeding. Video Assisted Thoracoscopic Surgery has shown to decrease the length of hospital stay compared to open thoracotomy. This could be attributed to the shorter chest tube duration in Video Assisted Thoracoscopic Surgeries. Fewer complications and lower in hospital mortality has been advocated in other studies as well. There is significantly lower rates of blood transfusion in the Video Assisted Thoracoscopic surgery (VATS) as compared to open thoracotomy. Patients demonstrate lesser postoperative pain and better quality of life when compared to traditional thoracotomies. Moreover, Video Assisted Thoracoscopic surgery (VATS) has been proposed as the recommended standard of care for management of lobectomies. Various advantages of Video Assisted Thoracoscopic surgery over conventional thoracotomy include decreased surgery time, easier control of bleeding, decreased post operative pain, decreased use of opioids, decreased chest tube duration, decreased hospital length of stay, decreased inflammatory response and superior cosmesis leading to better patient compliance. Additionally, Video Assisted Thoracoscopic Surgery (VATS) can be used for wide spectrum of thoracic surgeries including lung surgeries such as decortication, thymectomy, pericardiectomy to list few and can be used for traumatic thoracic cases as well, as seen in this case. However, Video Assisted Thoracoscopic surgery (VATS) by subxiphoid uniport approach is being exclusively practised for variety of cases at Teerthanker Mahaveer Medical College and Research Centre. As seen in this case traumatic perforation of the right atrium, right ventricle and the diaphragm is very rare complication which is life threatening. Immediate post pacemaker implantation Chest Xray indicated the position and immediate complication that occurred. Usually, immediate surgical intervention is needed in haemodynamically unstable patients. Video Assisted Thoracoscopic Surgery (VATS) subxiphoid uniport was used in this case and traumatic injury in the thorax secondary to Temporary Pacemaker implantation was successfully repaired signifying that Video Assisted Thoracoscopic surgery (VATS) is a good approach for such cases as well.

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