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Delayed lung perforation due to migrated AICD lead

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Abstract

Eight weeks after uncomplicated AICD implantation and uneventful postoperative course, a 17 years old patient was referred to our hospital with left sided pneumothorax and pectoral muscle twitches. A chest x-ray was performed and clearly showed a lung penetrating AICD lead. Surgery was performed by percutaneous extraction of the lead and implantation of a new AICD. The patient recovered without any further events.

Key words: automated implantable cardiac defibrillator, cardiac arrhythmia, pacemaker, lead, perforation

Introduction

Implantation of automated implantable cardiac defibrillators (AICD) or permanent pacemakers (PM) represents an effective treatment option for several cardiac arrhythmias. As the average age of patients receiving such devices increases, the risk of possible complications also does. Additionally, the used systems are getting more and more complex by modifications like coronary sinus leads or epimyocardial leads placed through a minithoracotomy. In this context, pneumothorax, cardiac effusion or lead perforations are uncommon but potentially life threatening events, with published rates of 1.0-7.0% (1-2). Whereas device related complications in older patients are well known, only a few numbers of cases in younger patients are described in the literature (3). Precisely because of that, early recognition and initiation of an appropriate therapy of device related complications are important for daily clinical practise.

Case report

A 17 year old male with normal constitution underwent successful cardiopulmonary resuscitation because of an acute incidence of ventricular fibrillation. After cardiomyopathy, right ventricular dysplasia or severe valvular disease was ruled out, an active fixation AICD lead (St. Jude Medical Fortify VR) was implanted via a puncture of the left subclavian vein. The device itself was positioned in a left sided pectoral pocket and the lead parameters were within normal limits (Sensing: 9,4mV; Pacing Impedance: 580Ohm; Detection threshold: 0,5V/0,5ms; Shock impedance: 42Ohm).

Chest x-ray performed the day after implantation showed correct position of the

lead and no pneumothorax (Fig 1A). The patient was referred to rehabilitation clinic in good clinical conditions.

Eight weeks after implantation, the patient was referred to our hospital, complaining of muscle twitches and a vibrant feeling inside of his chest. Additionally, he mentioned a slight dragging pain in the right arm under physiological stress. Performed chest x-ray clearly showed a lead perforation into the lung and an apical pneumothorax (Fig. 1B). No cardiac tamponade or hematothorax could be confirmed by transthoracic echocardiography. The patient was scheduled for urgent surgery.

Under general anesthesia, the pocket of the device was reopened. We explanted the AICD generator and pulled the lead out carefully. A new system was positioned into the old pocket and a new lead was placed in the right ventricle via the subclavian vein. To exclude cardiac tamponade, we performed a TEE control after every step of the surgical procedure. Due to absence of complications within surgery, the patient was transferred to the IMC ward.

Six days after surgery the patient was discharged in good conditions with a correctly functioning device. A chest x-ray control again showed correct position of the lead and no pneumothorax. An additionally performed TTE showed no suspicious signs for hematothorax or pericardial tamponade.

Discussion

As mentioned above, lead perforation is a rare but potentially life-threatening complication. With respect to the time point of their presentation, acute, subacute and delayed perforations have been defined in the literature. Acute lead perforation occurs within surgery till 24 hours after implantation, whereas subacute and delayed perforations are differentiated either occurring within or beyond one month after implantation (4). Khan et al. estimated the incidence of de-

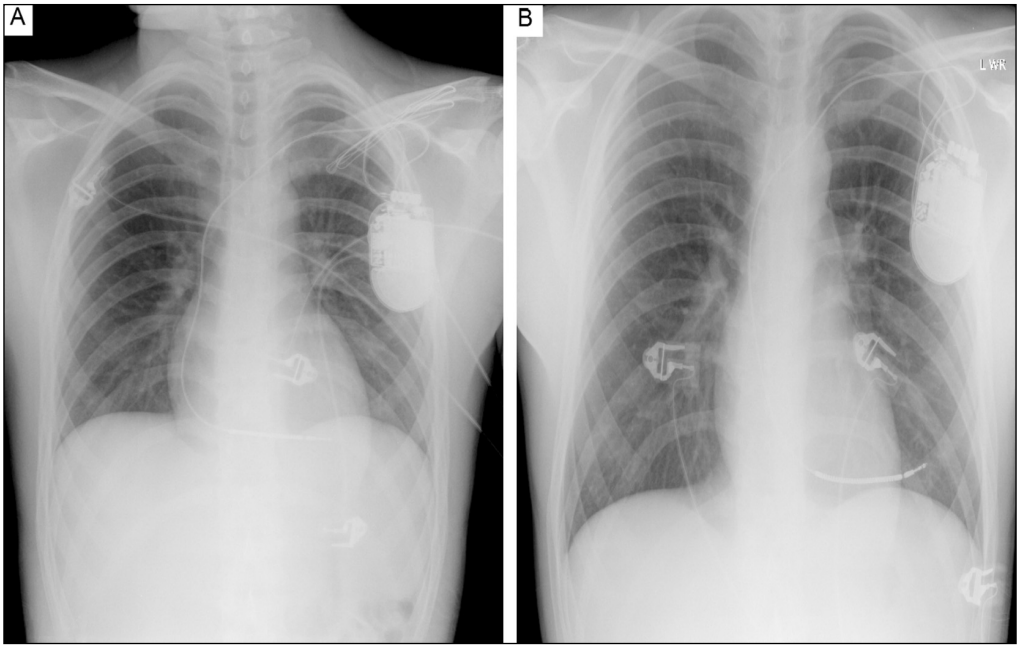

Figure 1: ***A:*** *Chest-X-ray prior to primary discharge showing no pathologic findings* ***B:*** *Chest-X-ray demonstrating the extracardiac tip position of the active-fixation lead, perforating the right ventricle and the lung.*

layed heart perforation at 0.1-0.8% for PM´s and 0.6-5.2% in AICD´s (5). Risk factors of lead perforation have not been defined until now, but there is general agreement that the type of lead used might influence the incidence of perforation (Tab. 1). Additionally, intracardiac location of the lead tip seems to be an independent risk factor. With respect to current literature, perforations occur more frequently in the apical location, as compared with septal position or in the right outflow tract. This may be contributed to the thinner right ventricular apex muscle (4-8). At least, patients heart muscle itself may contribute to lead perforation. Patients (especially elderly women) with congenital cardiomyopathy, anticoagulation and steroid therapy within 7 days of implantation as well as patients with low body mass (BMI < 20kg/m^2) are prone to perforation (6-7, 9).

As highlighted in our case report, clinical presentation of late perforation may vary widely from asymptomatic patients to sudden cardiac death. Table 2 shows a summary of clinical symptoms of lead perforation. Taken together, the most common symptom described in the literature has been device failure. However, there have been some reports on delayed perforations with normal electrophysiological parameters (10).

Once there is the suspicion for lead perforation, visualisation is an important stage. Key tests are: Chest x-ray, transthoracic or transoesophageal (TEE) echocardiography and computer tomography (CT scan). In this context, CT scan seems to play a crucial role, becoming a golden standard in visualisation (4, 6, 11-13).

Our current protocol is to perform chest x-ray 6 and 24 hours after implantation and echocardiography 24 hours postoperative, particularly in patients who required repeated lead positioning in the operating room. Based on the findings published by Hirschl et al., we suggest performing a ct-scan if the lead position is unclear. This group was able to show with a chest CT scan series performed in more than 100 pacemaker-dependent patients that partial perforation occurs with 2% of ventricular leads and 6% of atrial leads without their function being lost (14).

If lead perforation is detected, our treatment routine is percutaneous extraction in the operation room with TTE or TEE monitoring during and or after the procedure, with the cardiosurgical and anesthesiological team ready to intervene. This procedure is in line with most other authors (reviewed in 10) but inconsistent with the Heart Rhythm Society (HRS) expert consensus 2009, which classifies percutaneous lead extraction as class III indication, level of evidence C (15).

Table 1: Possible lead associated risk factors (modified from (10))

1. Leads for temporary stimulation
2. Atrial leads
3. Leads with active fixation systems
4. Defibrillator leads, with double spirals
5. Leads of excessive length after implantation
6. Small lead diameter
7. Leads with so called high resistance

Table 2: Clinical symptoms of lead perforation (modified from (10))

1. Chest pain
2. Dyspnoea
3. Device dysfunction
4. Inadequate ICD shocks
5. Abdominal pain
6. Hiccup
7. Mammary haematoma
8. Consequences of chest wall, lung or diaphragm perforation
9. Pleural or pericardial effusion

Conclusion

Delayed right ventricular and lung perforation due to migrated AICD lead is a rare complication, but genuine threat. Importantly, normal electrophysiological function does not exclude lead perforation. Considering our findings and those of others, optimal treatment seems to be percutaneous extraction of the perforating lead under TEE control und with cardiosurgical backup, through this opinion is inconsistent with the HRS expert consensus.

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