Case report - Arrhythmia

Challenging pacemaker implantation in a patient with acquired dextrocardia after pneumonectomy, skoliosis and complete heart block

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Abstract

Pacemaker implantation after pneumonectomy is rare and there have been no previously reported cases of acquired dextrocardia after implantation. The authors report the case of a pacemaker implantation in a patient with complete heart block, impaired left ventricular function, sclerosis of heart valves and radiation induced vasculopathy resulting in ostial stenosis of the right coronary artery 30 years after radiochemotherapy in childhood. Acquired dextrocardia after right pneumonectomy for mucoepidermoid carcinoma made implantation a challenge due to and poor fluoroscopic visualization of the heart and increased radio-opacity of the right chest when compared to congenital dextrocardia.

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1. Case report

A 40-year-old man, with a history of right-sided pneumonectomy, was referred to our institution because of weakness, dizziness, dyspnea on exertion and pain in the right upper abdomen.

At the age of 10, he had a right-sided pneumonectomy for mucoepidermoid carcinoma of the right main bronchus, followed by radiotherapy and high-dose chemotherapy with doxorubicine. He had undergone a subtotal thyroidectomy followed by radiotherapy and high-dose chemotherapy for mucoepidermoid carcinoma of the right main bronchus, with a broad complex ventricular escape rate at 25 bpm, with a vital capacity of 2 l (40% of predicted) without signs of obstruction (Tiffenau index of 106%). Apart from an elevated white cell count at 13,000/μl, other laboratory findings were within normal range. Echocardiography was only possible through a right parasternal window and demonstrated degenerative calcification of the mitral and aortic valves. Left ventricular function (LVF) was moderately reduced and the left ventricle was slightly dilated (54 mm).

The patient underwent coronary angiography which revealed radiation vasculopathy with an ostial stenosis of the right coronary artery. The high-grade stenosis was treated by stent implantation without resolution of the complete heart block.

Cardiac magnetic resonance imaging had been performed for evaluation of LVF one year earlier (Fig. 2, panel a and b) and had demonstrated the presence of the heart in the right hemithorax. The heart was rotated ~90° along its vertical axis and the major heart axis was aligned from the left shoulder to the right hip. LVF was moderately reduced (ejection fraction 41%).

The patient underwent implantation of a dual chamber pacemaker using a left-sided approach. Lead implantation, which was performed under fluoroscopic guidance using anteroposterior (a.p.) and 30° right-anterolateral oblique views, turned out to be challenging, as neither the cardiac silhouette nor the heart’s orientation were readily appreciable within the right hemithorax. Lead positions were identified as atrial and ventricular according to measured electrophysiological signal amplitudes. Finally, two active fixation bipolar electrodes were implanted in the right atrium and the right ventricle (Fig. 2, panel c and d). The pacemaker implantation proved to be successful with the patient being discharged in sinus rhythm.
Fig. 1. Twelve-lead ECGs (50 mm/s; 1 mV/cm) (a) seven years ago, (b) at presentation and (c) after pacemaker implantation.

Fig. 2. (a) Thoracic topography in a magnetic resonance image (coronal plane); (b) thoracic topography in a magnetic resonance image (axial plane); (c) chest X-ray after pacemaker implantation (a.p. projection); (d) chest X-ray after pacemaker implantation (lateral projection). LV, left ventricle; RV, right ventricle; Ao, aorta; PA, pulmonary artery; PV, pulmonary artery; a.p., anteroposterior.
was implanted underneath the pectoral muscle in this thin patient with pectus carinatum. Sensing and pacing threshold were within normal range.

2. Discussion

Dextrocardia is a condition in which the major axis of the heart points to the right. It can be congenital or acquired. Dextrocardia must be distinguished from dextroposition which is defined as the presence of the heart in the right hemi-thorax with normal alignment of the major heart axis. Acquired dextrocardia following right pneumonectomy has been previously reported [1].

There is very limited experience with pacemaker implantation after pneumonectomy and to the best of our knowledge there is no report of pacemaker implantation in acquired dextrocardia. There are isolated reports on pacemaker implantation in congenital dextrocardia [2–4]. In these cases, unlike in acquired dextrocardia after pneumonectomy, fluoroscopic discrimination of the heart itself is very possible and does not add further to the anatomical challenge of lead placement. The unusual topography of the heart makes preoperative visualization of the individual anatomy advisable when the clinical situation allows. In this case fluoroscopy was of limited value. PACing lead placement was guided by atrial and ventricular electrograms to overcome the described obstacles. Biventricular pacing was considered but not implemented in this patient according to guidelines as he was completely asymptomatic (NYHA I) for years prior to complete heart block. LVF was judged to be moderately reduced and thus prophylactic defibrillator implantation was not justified.

The potentially cardiotoxic effects of radiotherapy and chemotherapeutic agents, such as doxorubicin are well known in adults and children [5, 6]. Potential side effects of radiochemotherapy have to be considered even decades after its application in cardiac disease. In the present case heart block, reduced LVF and ostial stenosis of the right coronary artery are attributed to radiochemotherapy in childhood.

3. Conclusion

Pacemaker implantation is challenging in acquired dextrocardia due to increased radio-opacity of the right chest and poor fluoroscopic visualization of the heart when compared to congenital dextrocardia.

References