Magnetic resonance imaging in patients with conventional cardiac devices: a case report

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Introduction: Many patients with pacemaker develop a medical condition for which a magnetic resonance imaging (MRI) may be necessary. The evidence around conventional pacemaker being a contraindication to MRI is controversial.

Case report: A 73-year-old man presented with a 12-month worsening history of neck pain radiating to both arms with paresthesias and weakness in both arms. He had a conventional pacemaker implanted 5 years before. A week later he became quadriparetic, losing the ability to walk. MRI was deemed necessary and it was successfully performed with collaboration of cardiology and anesthesiology specialist. MRI revealed an intramedullary lesion suggestive of neoplasm and he was submitted to neurosurgical intervention.

Discussion: Based on the findings from several clinical studies the risk of MRI in patients with conventional pacemaker may be lower than previously thought if a number of conditions are met and appropriate precautions are taken.

Keywords: Magnetic resonance imaging, Pacemaker, Cardiac devices.
Introduction

In recent years the use of both magnetic resonance imaging (MRI) and cardiovascular implanted electronic devices has undergone remarkable growth [1, 2]. It is estimated that during their lifetime, up to 75% of patients with pacemaker develop a medical condition for which an MRI may be useful or even critically necessary for optimal diagnosis and treatment [3]. In neurology, MRI represents the gold standard in a broad range of central nervous system disorders. However, its safety in patients with conventional pacemaker has been debated for years. The evidence around conventional pacemaker being a contraindication to MRI is controversial [4].

Case report

A 73-year-old man presented with a 12-month worsening history of neck pain radiating to both arms with paresthesias and weakness in both arms. He had a conventional pacemaker implanted 5 years before for atrial flutter with bradycardia and he was pacing dependent. Initial neurological examination revealed bilateral brachial paresis with upper limb hyporeflexia and pyramidal signs present in lower limbs, positive Lhermitte sign, without sensation loss. Initial workup revealed normal cyanocobalamin/folate levels, autoimmunity study negative, serology for Borrelia burgdorferi, HIV 1/2, CMV, VDRL/TPHA negative, CSF with 11 cells/mm³, proteins 1216 mg/dL and glucose 126 mg/dL. Cervical CT-scan showed multisegmental spondylarthrosis. A week later the patient became quadriparetic, losing the ability to walk and urinary retention. First, a CT-myelogram revealed an abnormally expanded cervical spinal cord. However, a cervical MRI was deemed necessary and an informed consent was obtained from the patient. It was successfully realized in a 1.5T device. The pacemaker was programed to VOO/DOO (asynchronous) and then restored to original programming after MRI with collaboration of cardiology and anesthesiology specialists. MRI revealed an intramedullary lesion suggestive of a spinal cord neoplasm (Figure 1) and the patient was submitted to neurosurgical decompressive intervention. Histopathologic study of the lesion revealed a fibrillary astrocytoma.

Discussion

In recent years, with ‘MR-conditional’ devices being the new standard of care, MRI in these patients has been safely transposed to routine clinical practice today [2]. However, with the broad number of already existing implanted cardiac components, and the advancing imaging techniques with higher field strengths, MRI in patients with conventional pacemaker will remain a dilemma over the next years [2]. Based on the findings from several recent clinical studies the risk may be lower than previously thought if specific conditions are met and special precautions are taken [5, 6]. This recent findings led to the recommendations in the 2013 ESC guidelines where all those prerequisites are fully described. Essentially, after considering alternative imaging techniques and assuming that the benefit of MRI outweighs the risk of performing it; in patients with leads that have not matured (<6 weeks since implantation) and those with epicardial and abandoned leads should be excluded. Then, in pacemaker-dependent patients the device is programmed to asynchronous pacing mode whereas in patients without pacemaker dependence it is programmed to inhibited pacing mode. All other pacing functions are deactivated. During the MRI, continuous patient monitoring (electrocardiography/pulse oximetry) is essential. Immediately after MRI examination the device is re-programmed to original functions. Of note, a MRI at 1.5T should be preferred, as data on MRI performed at >1.5 T is still scarce [6].

A practical implication of these findings is that a low complication rate can be expected when the information provided by MRI seems vital, scanning with a 1.5T device and the specific requirements are observed [2, 6]. Nevertheless, achieving all these conditions requires specific extended knowledge and expertise, and also additional resources such as the ability for device programming and patient surveillance. Therefore such an approach will remain in the hands of a few specialized centers in the near future [2].

Competing interests

The authors declare no conflict of interest.

Figure 1. Cervical MRI, T2 STIR, showing an intramedullary lesion suggestive of a spinal cord neoplasm.
References


