Special article

First Magnetic Resonance Managed by a Cardiology Department in the Spanish Public Healthcare System. Experience and Difficulties of an Innovative Model

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Abstract

Magnetic resonance (MR) is considered the gold standard in the assessment of myocardial morphology, function, perfusion, and viability. However, its main limitation is its scarce availability. In 2014, we installed the first MR scanner exclusively managed by a cardiology department within the publicly-funded Spanish healthcare system with the aim of improving patient-care, training and research in the department. In the time interval analyzed, July 2014 to May 2017, 3422 cardiac MR scans were performed (32 minutes used per study; 96% with good quality; 75% with contrast media administration). The most prevalent clinical indications were cardiomyopathy (29%) and ischemic heart disease (12%). Twenty-five percent of studies were conducted in the context of research protocols. Follow-up studies predominated among outpatients, while pretherapeutic assessment was more common in hospitalized patients. The presumptive diagnosis was changed by cardiac MR scanning in up to 20% of patients investigated for ischemic heart disease. The installation and operative management of an MR scanner in our cardiology department has allowed us to integrate this technique into daily clinical practice, modify our clinical protocols, optimize access to this technology among cardiac patients, improve training, and conduct clinical research.

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Primera resonancia magnética gestionada por cardiología en la red sanitaria pública española: experiencia y dificultades de un modelo innovador

Resumen

La resonancia magnética (RM) es la técnica considerada de referencia para evaluar la morfología, función, perfusión y viabilidad miocárdica, y su principal limitación es su escasa disponibilidad. En 2014 se implantó la primera RM gestionada por un servicio de cardiología de un hospital de la red sanitaria pública española con el objetivo de mejorar el proceso asistencial, formativo e investigador del servicio. En el periodo analizado, desde julio de 2014 a mayo de 2017, se realizaron 3.422 RM cardíacas (32 min estudio, el 96% de buena calidad, el 75% con medio contraste). Las miocardipatías (29%) y la cardiopatía isquémica (12%) fueron las indicaciones asistenciales más frecuentes. El 25% de los estudios correspondieron a protocolos de investigación. En los pacientes ambulatorios, predominaron los estudios de seguimiento, y en los ingresados, las valoraciones previas a intervención terapéutica. En el campo de la cardiopatía isquémica, la RM cardíaca modificó el diagnóstico de sospecha de hasta el 20% de los pacientes. La instalación y gestión del equipo de RM en un servicio de cardiología ha permitido integrar esta técnica en el día a día de los profesionales, modificar los protocolos asistenciales, optimizar la accesibilidad de esta tecnología para los pacientes cardiológicos, mejorar la formación y desarrollar la investigación.

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INTRODUCTION

Magnetic resonance (MR) is considered the gold standard in the evaluation of myocardial morphology, function, flow, perfusion, and viability, all in a single and completely noninvasive test. The first work with cardiac MR dates from the beginning of the 1980s and Spanish cardiology adopted the technique in the mid-1990s. During the last decade, its clinical use has become widespread in virtually all third-level Spanish hospitals. The latest available data from the RECALCAR 2015 registry showed an average of 403 ± 269 studies per tertiary center.

Due to technological advances and rapid improvements in cardiac MR, the initial indications for the modality have been expanded and are undergoing continuous growth. This increase has intensified the problem of waiting lists and complicates access to machine time in most hospitals because the procedures are conducted in integrated systems in radiology departments, which must handle more than just cardiovascular conditions. Accordingly, the Spanish Society of Cardiology and the Spanish Society of Medical Radiology developed a consensus document recommending the creation of multidisciplinary heart disease units or committees under the coordination and supervision considered most appropriate in each case, considering the characteristics of each center.

In this article, we present our initial experience with the operative management of the first MR system installed in a cardiology department in a hospital in the Spanish national health system.

STARTING POINT AND OBJECTIVES OF THE MAGNETIC RESONANCE SYSTEM INSTALLATION

At the end of the 2013, our center had 2 MR systems, both in the radiology department. Cardiovascular studies were performed with a 0.5T system, which could handle about 100 studies annually. The radiology and cardiology departments performed and interpreted the studies together. Due to the low intensity of the magnetic field, the study quality failed to meet recommended standards. Additionally, the health care delay exceeded 24 months.

Due to the need to improve waiting times and study number and quality, in addition to the limitation on acquisition time in the systems installed at that time and, finally, the desire of the cardiology department to participate in research projects requiring MR, a set of actions was undertaken that led to the installation of an MR system in the cardiology department. The hypothesis was that this action would constitute the ideal setting for the systematic incorporation of best clinical practices, bring patient care closer to the patient's natural environment, and promote the effective participation of professionals, adoption of new forms of action, and research innovation and development. Based on this hypothesis, an MR system was installed in order to improve patient care, training, and research in the cardiology department.

LOCATION, SYSTEM, AND TOOLS

After a viability plan, it was decided to place the MR system in the area of the cardiology department assigned to procedures (Figure 1). The work took 4 months, from March to July 2014.

The system installed was a Philips Achieva DS 1.5T (Philips Healthcare; the Netherlands), with gradient strengths of up to 66 mT/m and a speed of up to 180 T/m/s. Chest and cardiac coils

Figure 1. Detail of the location and facility modifications required for installation of the magnetic resonance (MR) system. The MR system occupied an area previously assigned to the secretariat, training room, offices, and clinics on the second floor of the building. Installation of the system required a detailed architectural study and an adaptation plan to guarantee that the building, opened in 1975, was capable of supporting the 3800 kg weight of the MR system. It was necessary to reinforce the structure and install magnetic shielding in the lower floor, build a Faraday cage, and install a Quench tube to the exterior (detail in the upper right panel). The magnet, due its size and weight, was introduced through the building facade. A comparison is shown of the faculty layout before and after assembly of the MR system. The lower right panel shows the MR system during the installation process.
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