



ORIGINAL REPORT

Preoperative and follow-up cardiac magnetic resonance imaging of candidates for surgical ventricular restoration[☆]



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KEYWORDS

Cardiac magnetic resonance;
Ischemic heart disease;
Left ventricular aneurysm;
Left ventricular reconstruction

Abstract

Purpose: To assess pre and post-operative cardiac MRI (CMR) findings in patients with left endoventriculoplasty repair for ventricular aneurysm due to ischemic heart disease.

Material and methods: Data were retrospectively gathered on 21 patients with diagnosis of ventricular aneurysm secondary to ischemic heart disease undergoing left endoventriculoplasty repair between January 2007 and March 2013. Pre and post-operative CMR were performed in 12 patients. The following data were evaluated in pre-operative and post-operative CMR studies: quantitative analysis of left ventricular ejection fraction (LVEF), left ventricular end-diastolic (LVEDV) and end-systolic (LVESV) volume index, presence of valvular disease and intracardiac thrombi. The time between surgery and post-operative CRM studies was 3–24 months.

Results: Significant differences were found in the pre and post-operative LVEF, LVEDV and LVESV data. EF showed a median increase of 10% (IQR: 2–15) ($p=0.003$). The LVEDV showed a median decrease of 38 ml/m² (IQR: 18–52) ($p=0.006$) and the LVESV showed a median decrease of 45 ml/m² (IQR: 12–60) ($p=0.008$). Post-operative ventricular volume reduction was significantly higher in those patients with preoperative LVESV >110 ml/m² (59 and 12 ml/m², $p=0.006$).

Conclusion: In patients with ischemic heart disease that are candidates for left endoventriculoplasty, CMR is a reliable non-invasive and reproducible technique for the evaluation of the scar before the surgery and the ventricular volumes and its evolution after endoventricular surgical repair.

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PALABRAS CLAVE

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Cardiopatía
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Aneurisma
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Restauración
ventricular quirúrgica

Resonancia magnética cardíaca prequirúrgica y de seguimiento en pacientes candidatos a endoventriculoplastia

Resumen

Objetivo: Valorar con resonancia magnética cardíaca (RMC) el resultado de la endoventriculoplastia y compararlo con los hallazgos prequirúrgicos en pacientes con miocardiopatía dilatada isquémica y aneurisma ventricular.

Material y métodos: Revisamos retrospectivamente 21 pacientes consecutivos con miocardiopatía dilatada isquémica sometidos a endoventriculoplastia entre enero de 2007 y marzo de 2013. En 12 de ellos se realizó RMC pre- y posquirúrgica. En las RMC diagnóstica y posquirúrgica se hizo un análisis cuantitativo de la fracción de eyección (FEVI), volúmenes telediastólico (VTDVI) y telesistólico (VTSVI) del ventrículo izquierdo indexados, y se valoraron las valvulopatías y trombos intracavitarios. El tiempo transcurrido entre la intervención quirúrgica y los estudios de control con RMC osciló entre 3 y 24 meses.

Resultados: La FEVI y los VTDVI y VTSVI pre- y posquirúrgicos fueron significativamente diferentes. La mediana de la FEVI aumentó el 10% (rango intercuartílico: 2–15) ($p=0,003$); la mediana del VTDVI disminuyó 38 ml/m² (rango intercuartílico: 18–52) ($p=0,006$), y la mediana del VTSVI disminuyó 45 ml/m² (rango intercuartílico: 12–60) ($p=0,008$). La reducción del volumen posquirúrgico fue mayor en pacientes con VTSVI basal > 110 ml/m² (59 ml/m² y 12 ml/m², $p=0,006$).

Conclusión: En pacientes con cardiopatía isquémica candidatos a endoventriculoplastia, la RMC es una técnica incruenta, reproducible y fiable para estudiar la cicatriz miocárdica antes de la intervención y los volúmenes ventriculares y su evolución tras la endoventriculoplastia.

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Introduction

Coronary disease is responsible for approximately two-thirds of the cases of congestive heart failure. Nearly 20% of the patients who have suffered an acute myocardial infarction develop a ventricular dilation despite an early reperfusion.¹ In response to the local ischemia, there may occur a ventricular remodeling with enlargement, conversion of the normal elliptical geometry into spherical shape and worsening of the overall systolic function, which ends up in heart failure. The left ventricle volume is a sensitive marker of ischemic ventricular dysfunction, especially the telesystolic volume which is an important predictor of prognosis after the infarction.^{1–3} Dilation is serious when it is greater than twice the indexed normal ventricular indexes.⁴

Although the current pharmacological treatment and cardiac resynchronization have improved survival in these patients, many need heart transplants.⁵ Due to the shortage of donors,^{6,7} interest in surgical ventricular restoration as treatment of end-stage ischemic cardiopathy has increased since it has demonstrated that it improves functional class and long-term survival.^{8,9} Surgical ventricular restoration has three goals: (a) exclude the akinetic or dyskinetic areas (anterior, apical and septal portions) diminishing left ventricle volume and recovering the elliptical shape with a Dacron patch (endoventricular circular patch plasty (EVCPP) or Dor procedure); (b) revascularize the ischemic areas, and (c) correct mitral regurgitation if any. Candidates to this procedure are patients with ischemic dilated myocardopathy due to an old previous infarction, symptoms of advanced congestive heart failure (New York Heart Association [NYHA], III–IV),

akinetic or dyskinetic areas covering $\geq 35\%$ of the left ventricle surface and left ventricle telesystolic volume (LVTSV) of ≥ 60 ml/m². The akinesia or dyskinesia of the theoretically not infarcted areas makes us study feasibility before performing the endoventricular circular patch plasty for the detection of areas with reversible ischemia.¹⁰

In patients considered for endoventricular circular patch plasty, cardiac magnetic resonance imaging (CMRI) allows measuring ventricular volumes accurately, as well as the overall and regional function of the left ventricle, the infarcted perimeter, detecting intra-cavity thrombi, making a surgical map and deciding the need for revascularization since it allows us to evaluate thickness, function and feasibility of the remaining myocardium.^{4,11,12} After the endoventricular circular patch plasty it allows us to assess the morphological and functional changes and the reduction in scar size in the late enhancement sequences.⁴

Our goal was to assess the results of surgical ventricular restoration with CMRI and compare it with the preoperative findings in patients with ischemic dilated myocardopathy and ventricular aneurism.

Materials and methods**Patients**

We went through the medical histories retrospectively and the CMRI of 21 consecutive patients with surgical ventricular restoration associated with coronary revascularization who underwent surgery in our hospital between January 2007 and

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