



ORIGINAL REPORT

Multidetector computed tomography shows reverse cardiac remodeling after double lung transplantation for pulmonary hypertension[☆]



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KEYWORDS

Pulmonary hypertension;
Lung transplant;
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Abstract

Objective: To use multidetector computed tomography (MDCT) to evaluate the structural changes in the right heart and pulmonary arteries that occur in patients with severe pulmonary hypertension treated by double lung transplantation.

Material and methods: This was a retrospective study of 21 consecutive patients diagnosed with severe pulmonary hypertension who underwent double lung transplantation at our center between 2010 and 2014. We analyzed the last MDCT study done before lung transplantation and the first MDCT study done after lung transplantation. We recorded the following variables: diameter of the pulmonary artery trunk, ratio of the diameter of the pulmonary artery trunk to the diameter of the ascending aorta, diameter of the right ventricle, ratio of the diameter of the left ventricle to the diameter of the right ventricle, and eccentricity index. Statistical analysis consisted of the comparison of the means of the variables recorded.

Results: In all cases analyzed, the MDCT study done a mean of 24 ± 14 days after double lung transplantation showed a significant reduction in the size of the right heart chambers, with improved indices of ventricular interdependency index, and reduction in the size of the pulmonary artery trunk ($p < 0.001$ for all the variables analyzed).

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PALABRAS CLAVE

Hipertensión pulmonar;
Trasplante pulmonar;
Remodelamiento cardíaco;
Tomografía computarizada multidetector

Conclusion: Patients with pulmonary hypertension treated by double lung transplantation present early reverse remodeling of the changes in the structures of the right heart and pulmonary arterial tree. MDCT is useful for detecting these changes.

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Remodelado cardíaco inverso en pacientes con hipertensión pulmonar tras trasplante bipulmonar. Estudio con tomografía computarizada multidetector

Resumen

Objetivo: Valorar mediante tomografía computarizada multidetector (TCMD) los cambios estructurales del corazón derecho y de las arterias pulmonares que se producen en los pacientes con hipertensión pulmonar (HP) grave tratados mediante trasplante bipulmonar (TxBP).

Material y métodos: Estudio retrospectivo de 21 pacientes consecutivos diagnosticados de HP grave, a los que se realizó TxBP en nuestro centro hospitalario durante los años 2010–2014. Se analizó la TCMD realizada previa al trasplante pulmonar, y la primera disponible después. Se obtuvieron las siguientes variables: diámetro del tronco de la arteria pulmonar, relación diámetro tronco de la arteria pulmonar/diámetro de la aorta ascendente, diámetro del ventrículo derecho, relación diámetro ventrículo izquierdo/derecho e índice de excentricidad. Se realizó un análisis estadístico con comparación de medias de las diferentes variables recogidas.

Resultados: En todos los casos analizados se observó, en la TCMD realizada, una media de 24 ± 14 días post-TxBP, una reducción significativa del tamaño de las cavidades derechas, con mejoría de los índices de interdependencia ventricular y del tamaño del tronco de la arteria pulmonar ($p < 0,001$ para todas las variables analizadas).

Conclusión: Los pacientes con HP tratados mediante TxBP presentan un remodelado inverso precoz de los cambios estructurales cardíacos derechos y del árbol arterial pulmonar. La TCMD es útil para detectar dichos cambios.

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Introduction

Pulmonary hypertension (PH) is a hemodynamic condition defined by the existence of a mean pulmonary arterial pressure (mPAP) ≥ 25 mmHg measured at rest through right cardiac catheterization.^{1–3}

It is a hemodynamic concept that represents the final common pathway of several diseases of different origins. Regardless of the etiologic PH group, the afterload progressive elevation that occurs in patients with PH causes morphologic and functional changes in the right cardiac cavities and the pulmonary vascular tree.^{2–4} The right ventricle (RV) capacity to meet a progressive elevation of pulmonary vascular resistances (PVR) is the main determining factor of functional capacity and survival of these patients.^{5,6}

Double-lung transplant (DLT), considered one of the treatment options for patients with advanced PH achieves an abrupt normalization of PVR with the subsequent acute reduction of afterload.^{7,8}

There are few studies that evaluate reverse remodeling of an inevitably dilated RV with serious systolic dysfunction occurring in patients with PH treated with DLT. On the other hand the few studies published have used echocardiography or magnetic resonance images to assess these changes.

The goal of our work is to assess by multidetector computed tomography (MDCT) the structural changes of the right

heart and the pulmonary arteries occurring in patients with serious PH who undergo DLT.

Material and methods

A retrospective study was conducted of 21 consecutive patients diagnosed with serious PH who underwent DLT at our hospital during the years 2010–2014.

The presence of a mPAP above 35 mmHg in the cardiac catheterization performed before the transplant was considered serious. Among the 21 patients, 17 belonged to #1 of the Nice classification.² The 4 remaining patients belonged to Nice #3 (PH due to pulmonary disease). They all suffered from chest MDCT pre and post-DLT.

The study was approved by our center Ethics and Clinical Research Committee.

The studies were conducted on a 64-detector MDCT machine (Brilliance 64, Philips Medical Systems, Cleveland, OH, USA), without cardiac synchronization, with the following parameters: collimation of 64×0.625 with a slice thickness/reconstruction of $1/0.5$ mm; rotation time 0.5 s; 120 kVp, and dose modulation; 90 cm³ of IV non-ionic iodized contrast were administered (Iohexol, Omnipaque 350, GE Healthcare, Ireland) at a flow of 4 cm³/s using a bolus tracking technique, locating the region of interest (ROI) in

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