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CLINICAL RESEARCH

Speckle-tracking imaging in patients with Eisenmenger syndrome

Speckle-tracking *et syndrome d'Eisenmenger*

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Summary
Background. — Adults with Eisenmenger syndrome have a survival advantage over those with idiopathic pulmonary arterial hypertension. Improved survival may result from preservation of right ventricular (RV) function.
Aims. — To assess left ventricular (LV) and RV remodelling in patients with Eisenmenger syndrome compared to a control population, using speckle-tracking imaging.
Methods. — Adults with Eisenmenger syndrome and healthy controls were enrolled into this prospective two-centre study. Patients with Eisenmenger syndrome with low acoustic windows, irregular heart rhythm or complex congenital heart disease were excluded. Clinical assessment, B-type natriuretic peptide (BNP), 6-minute walk test and echocardiography (including dedicated views to perform offline two-dimensional-speckle-tracking analysis) were performed on inclusion.

Abbreviations: 2D, two-dimensional; BNP, B-type natriuretic peptide; DICOM, Digital Imaging and Communications in Medicine; DVD, digital video disc; LV, left ventricular; NYHA, New York Heart Association; PAH, pulmonary artery hypertension; RV, right ventricular; SD, standard deviation; TAPSE, tricuspid annular plane systolic excursion.

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Results. — Our patient population ($n = 37$; mean age 42.3 ± 17 years) was mostly composed of patients with ventricular septal defect (37.8%) or atrial septal defect (35.1%). Compared with the control population ($n = 30$), patients with Eisenmenger syndrome had reduced global LV longitudinal strain (-17.4 ± 3.5 vs. -22.4 ± 2.3; $P < 0.001$), RV free-wall longitudinal strain (-15.0 ± 4.7 vs. -29.9 ± 6.8; $P < 0.001$) and RV transverse strain (25.8 ± 25.0 vs. 44.5 ± 15.1; $P < 0.001$). Patients with Eisenmenger syndrome also more frequently presented a predominant apical longitudinal and transverse strain profile. Among patients with Eisenmenger syndrome, those with a post-tricuspid shunt presented with reduced global LV longitudinal strain but increased RV transverse strain, compared to patients with pre-tricuspid shunt.
Conclusion. — Patients with Eisenmenger syndrome had impaired longitudinal RV and LV strain, but present a relatively important apical deformation. RV and LV remodelling, as assessed by speckle-tracking imaging, differ between patients with pre- and post-tricuspid shunt.

MOTS CLÉS
Cardiopathies congénitales ;
Hypertension pulmonaire ;
Syndrome d'Eisenmenger ;
Échocardiographie ;
Speckle-tracking imaging

Résumé
Contexte. — Les patients avec syndrome d'Eisenmenger présentent un avantage de survie par rapport aux patients avec hypertension artérielle pulmonaire non liée aux cardiopathies congénitales. La préservation de la fonction ventriculaire droite (VD) pourrait expliquer cet avantage.
Objectifs. — D'étudier le remodelage ventriculaire droit et gauche (VG) à l'aide du « speckle-tracking imaging » chez les patients avec syndrome d'Eisenmenger.
Méthodes. — Nous avons inclus de façon prospective patients avec syndrome d'Eisenmenger et des patients témoins au sein d'une étude bicentrique. Les patients atteints d'un syndrome d'Eisenmenger lié à une cardiopathie congénitale complexe, peu échogènes ou en arythmie ont été exclus.
Résultats. — Notre population de syndrome d'Eisenmenger ($n = 37$; âge moyen $42,3 \pm 17$ années) se compose majoritairement de patients avec communication inter-ventriculaire (37,8 %) et inter-atriale (35,1 %). Comparativement à la population témoin ($n = 30$), les patients présentent une réduction du strain global longitudinal VG ($-17,4 \pm 3,5$ vs $-22,4 \pm 2,3$; $p < 0,001$), du strain longitudinal ($-15,0 \pm 4,7$ vs $-29,9 \pm 6,8$; $p < 0,001$) et transverse VD ($25,8 \pm 25,0$ vs $44,5 \pm 15,1$; $p < 0,001$). Ils présentent également de façon plus fréquente un profil de déformation apicale important. Au sein de la population avec syndrome d'Eisenmenger, les patients avec shunt post-tricuspide ont un strain longitudinal VG réduit tandis que leur strain transverse VD est meilleur par rapport aux patients avec shunt pré-tricuspide.
Conclusion. — Les patients avec syndrome d'Eisenmenger présentent une altération du strain longitudinal VD et VG, mais un profil de déformation VD avec déformation apicale prédominante. Le remodelage VD et VG évalué par la technique du *speckle-tracking* a aussi permis de constater des différences dans la population syndrome d'Eisenmenger en fonction de la localisation du shunt pré- ou post-tricuspide.

Introduction

Pulmonary hypertension is a severe disorder defined as an increase in mean pulmonary arterial pressure > 25 mmHg at rest [1]. Patients with pulmonary hypertension can be divided into subgroups sharing similar underlying pathophysiology [2]. Eisenmenger syndrome is the most advanced form of pulmonary artery hypertension (PAH) associated with congenital heart disease. Patients with Eisenmenger syndrome have a survival advantage over those with other causes of PAH [3]. Survival and symptoms are closely related to right ventricular (RV) function and adaptation [4—8]. Improved survival may result from preservation of RV function, as the right ventricle may not undergo 'normal' remodelling at birth and sustain raised pulmonary vascular resistance. Differences within the spectrum of Eisenmenger syndrome have already been described, especially between patients with pre- and post-tricuspid shunt [9]. Thus, we hypothesize that different cardiac remodelling might explain the differences observed between patients with pre- and post-tricuspid shunt.