Canadian Journal of Cardiology 31 (2015) 1012–1018

Clinical Research

The Assessment of Atrial Electromechanical Delay in Patients With Acromegaly

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ABSTRACT

Background: We aimed to evaluate whether atrial electromechanical delay (AEMD) measured by tissue Doppler imaging (TDI), which is an indicator for structural and electrical remodelling of the atria, is prolonged in patients with active or inactive acromegaly, or both, compared with a control group.

Methods: A total of 34 patients with acromegaly (18 active/16 inactive) and 35 patients as a control group were enrolled. Both intra- and inter-AEMD were calculated by TDI. The correlation between clinical variables and AEMD were analyzed.

Results: Both inter-AEMD and right and left intra-AEMD were prolonged in patients with acromegaly compared with the control group ($P < 0.001$, $P < 0.001$, and $P = 0.004$, respectively). Also, patients with active acromegaly showed higher inter-AEMD and right intra-AEMD compared with patients with inactive acromegaly ($P < 0.05$). There was no significant difference in left intra-AEMD between patients

RÉSUMÉ

Introduction : Nous avions pour but d'évaluer si le retard de conduction électromécanique auriculaire (AEMD : *atrial electromechanical delay*) mesuré par imagerie Doppler tissulaire (IDT), qui est un indicateur du remodelage structurel et électrique des oreillettes, est prolongé chez les patients atteints d'acromégalie active ou inactive, ou les deux, comparativement à un groupe témoin.

Méthodes : Nous avons inscrit un total de 34 patients atteints d'acromégalie (18 actives/16 inactives) et 35 patients pour former le groupe témoin. Nous avons calculé par IDT les intra-AEMD et les inter-AEMD. Nous avons analysé la corrélation entre les variables cliniques et les AEMD.

Résultats : Les inter-AEMD et les intra-AEMD droits et gauches étaient prolongés chez les patients atteints d'acromégalie comparativement au groupe témoin ($P < 0{,}001$, $P < 0{,}001$ et $P = 0{,}004$, respectivement). Aussi, les patients atteints d'acromégalie active montraient des inter-AEMD et des intra-AEMD droits plus élevés comparativement aux

Acromegaly most commonly arises from a pituitary adenoma and is characterized by an excessive secretion of growth hormone (GH) and insulin-like growth factor-1 (IGF-1).[1] Cardiovascular complications are known as the most common cause of morbidity and mortality in acromegaly.[2] As a distinct clinical entity, *acromegalic cardiomyopathy* is characterized by concentric biventricular hypertrophy, diastolic dysfunction, impaired systolic function, and ultimately heart failure, which is dependent on the duration of the disease.[3,4] Another feature of acromegaly, cardiac arrhythmias (including ectopic beats, paroxysmal supraventricular tachycardia, paroxysmal atrial fibrillation, and ventricular tachycardia) are also more frequent compared with the normal population.[5] Although the underlying mechanism causing cardiac arrhythmia remains unclear, it is proposed that myocardial fibrosis induced by excessive GH and IGF-1 might be a reason for this condition.[5,6]

Previous data showed that tissue Doppler echocardiography can be a useful technique to evaluate atrial conduction times.[7] Atrial electromechanical delay (AEMD), which can be simply assessed by using tissue Doppler imaging (TDI) (PA-TDI duration, where PA = the time interval from the onset of the P wave on the surface electrocardiogram to the beginning of the A wave interval with tissue Doppler echocardiography) and has been proposed as a marker of the extent of both electrical and structural remodelling of the atria, which are essential in the pathophysiology of atrial arrhythmias.[8] Also,

Received for publication January 15, 2015. Accepted February 22, 2015.

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See page 1017 for disclosure information.

http://dx.doi.org/10.1016/j.cjca.2015.02.026

with active acromegaly and those with inactive acromegaly ($P = 0.977$). The growth hormone and insulin-like growth factor (IGF-1) levels positively correlated with inter-AEMD ($r = 0.577$; $P < 0.001$; $r = 0.614$; $P < 0.001$, respectively). Additionally, we found that inter-AEMD was significantly and positively correlated with relationship between maximal values of passive mitral inflow (E, PW-Doppler) and lateral early diastolic mitral annular velocities (e′, TDI) ($r = 0.316$; $P = 0.008$). Only the serum IGF-1 level was independently associated with inter-AEMD in multivariate linear regression analysis ($\beta = 0.500$; $P = 0.011$).

Conclusions: Our study findings showed that both inter- and intra-AEMD are prolonged in patients with acromegaly. Also, AEMD was observed to be more prolonged in patients with active acromegaly than in those with inactive acromegaly. IGF-1 was an independent predictor of inter- AEMD in patients with acromegaly. Being a noninvasive, inexpensive, and simple technique, AEMD may be used as an indicator for atrial electrical and structural remodelling in patients with acromegaly.

patients atteints d'acromégalie inactive ($P < 0,05$). Il n'existait aucune différence significative de l'intra-AEMD gauche entre les patients atteints d'acromégalie active et ceux atteints d'acromégalie inactive ($P = 0,977$). Les concentrations de l'hormone de croissance et du facteur de croissance insulinomimétique de type 1 (IGF-1 : *insulin-like growth factor*) corrélaient positivement avec l'inter-AEMD ($r = 0,577$; $P < 0,001$; $r = 0,614$; $P < 0,001$, respectivement). De plus, nous avons observé que l'inter-AEMD corrélait significativement et positivement à la relation entre les valeurs maximales de flux mitral passif (E, PW-Doppler) et les vélocités mitrales annulaires en diastole précoce au niveau latéral (e′, IDT) ($r = 0,316$; $P = 0,008$). À l'analyse de régression linéaire multivariée, seule la concentration sérique du IGF-1 était indépendamment associée à l'inter-AEMD ($\beta = 0,500$; $P = 0,011$).

Conclusions : Les résultats de notre étude montraient que l'inter-AEMD et l'intra-AEMD sont prolongés chez les patients atteints d'acromégalie. Aussi, nous avons observé que l'AEMD était plus prolongé chez les patients atteints d'acromégalie active que chez ceux atteints d'acromégalie inactive. Le IGF-1 était un prédicteur indépendant de l'inter-AEMD chez les patients atteints d'acromégalie. Étant une technique non invasive, peu coûteuse et simple, l'AEMD peut être utilisé comme indicateur du remodelage électrique et structurel des oreillettes chez les patients atteints d'acromégalie.

prolonged intra- and interatrial electromechanical delay measured by TDI has been significantly associated with a higher prevalence of new or recurrent atrial fibrillation (AF).[9] However, current data regarding the impact of acromegaly on atrial conduction times are unclear.[10] Therefore, the purpose of our study was to assess the atrial conduction times in patients with active acromegaly and those with inactive acromegaly compared with a control group.

Methods

Study population

A total of 34 patients with acromegaly and 35 control participants were enrolled in this study. Acromegaly was determined by failure of suppression of serum GH levels to < 1.0 ng/mL after a 75-g oral glucose tolerance test (OGTT) together with fasting serum IGF-1 concentrations higher than the normal ranges for age and sex and the presence of clinical features of acromegaly.[11] Patients with acromegaly were categorized into 2 groups with respect to activity of disease as active acromegaly (n = 18 patients) and inactive acromegaly (n = 16 patients). Inactive acromegaly was identified as a GH level < 1.0 ng/mL on a 75-g OGTT, or in patients receiving somatostatin analogues, a random GH level of < 1.0 ng/mL and IGF-1 values in the reference ranges for age and sex.[12] The inactive acromegaly group was composed of patients who had been in remission for at least 6 months. Patients with untreated hormonal deficiencies, tobacco use, renal failure, uncontrolled hypertension, uncontrolled diabetes, heart failure, valvular heart disease, coronary artery disease, malignancy, active infectious or inflammatory disease (or both), chronic obstructive pulmonary disease, alcohol abuse, medications known to alter cardiac conduction, and history of documented cardiac arrhythmia such as AF and ventricular pre-excitation and atrioventricular conduction abnormalities were excluded from the study. Informed consent was obtained from each patient before enrollment. The study was in compliance with the principles outlined in the Declaration of Helsinki and was approved by our institutional ethics committee.

In all participants, a detailed cardiovascular and systemic examination was performed at the beginning of the study, with demographic data and anthropometric measures including weight, height, and body mass index (BMI).

Laboratory tests

Blood samples from all patients were also supplied early in the morning after 12 hours of fasting. Serum fasting blood glucose and serum creatinine levels were evaluated by a local laboratory using standard laboratory methods. Serum total cholesterol, high-density lipoprotein (HDL) cholesterol, and triglyceride levels were determined by an autoanalyzer (Olympus AU2700, Olympus, Tokyo, Japan) with enzymatic colorimetric methods using commercial kits (Beckman Coulter, Brea, CA). Low-density cholesterol levels were assessed using the Friedewald formula.[23] Serum GH levels were measured with an Immulite 2000 (Siemens Medical Solutions, Malvern, PA) autoanalyzer using the chemiluminescence method. Serum IGF-1 levels were determined with an immunoradiometric assay using a Beckman-Coulter Immunotech kit. Age- and sex-matched normal reference ranges were used for evaluation according to the kit guide.

Transthoracic echocardiography

Echocardiographic examination was performed by using a Vivid 7 Dimension cardiovascular ultrasound system (Vingmed-General Electric, Horten, Norway) with a 3.5-MHz transducer. Echocardiographic examination was performed with the patient in the left lateral decubitus position. Parasternal long- and short-axis views and apical views were used as standard imaging windows. Left atrial dimension, left ventricular (LV) end-systolic and end-diastolic dimensions, and LV diastolic septal and