Rev Esp Cardiol. 2012;65(11):1003–1009

Original article

Structural and Functional Inverse Cardiac Remodeling After Cavotricuspid Isthmus Ablation in Patients With Typical Atrial Flutter

Javier García-Seara,[a,*] Francisco Gude,[b] Pilar Cabanas-Grandío,[a] José L. Martínez-Sande,[a] Xesús Fernández-López,[a] Juliana Elices-Teja,[a] Sergio Raposeiras Roubin,[a] and José R. González-Juanatey[a]

[a] Servicio de Cardiología, Hospital Clínico de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain
[b] Unidad de Epidemiología Clínica, Hospital Clínico de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

Article history:
Received 15 February 2012
Accepted 30 March 2012
Available online 26 July 2012

Keywords:
Atrial flutter
Cavotricuspid isthmus
Radiofrequency ablation
Structural remodeling

ABSTRACT

Introduction and objectives: The purpose of the present study is to determine the structural and functional cardiac changes that occur in patients at 1-year follow-up after ablation of typical atrial flutter.
Methods: We enrolled 95 consecutive patients referred for cavotricuspid isthmus ablation. Echocardiography was performed at ≤6 h post-procedure and 1-year follow-up.
Results: Of 95 patients initially included, 89 completed 1-year follow-up. Hypertensive cardiopathy was the most frequently associated condition (39%); 24% of patients presented low baseline left ventricular systolic dysfunction. We observed a significant reduction in right and left atrial areas, end-diastolic and end-systolic left ventricular diameters, and interventricular septum. We observed substantial improvement in right atrium contraction fraction and left ventricular ejection fraction, and a reduction in pulmonary hypertension. Changes in diastolic dysfunction pattern were observed: 60% of patients progressed from baseline grade III to grade I; at 1-year follow-up, this improvement was found in 81%. We found no structural differences between paroxysmal and persistent atrial flutter at baseline and 1-year follow-up, exception for basal diastolic function.
Conclusions: In patients with typical atrial flutter undergoing cavotricuspid isthmus catheter ablation, we found inverse structural and functional cardiac remodeling at 1-year follow-up with much improved left ventricular ejection fraction, right atrium contraction fraction, and diastolic dysfunction pattern.

Remodelado cardiaco inverso estructural y funcional en pacientes con aleteo auricular típico sometidos a ablación del istmo cavotricuspídeo

Palabras clave:
Aleteo auricular
Istmo cavotricuspídeo
Ablación por radiofrecuencia
Remodelado estructural

RESUMEN

Introducción: y objetivos El propósito de este trabajo es evaluar los cambios cardiacos estructurales y funcionales que se producen tras 1 año de seguimiento de pacientes sometidos a ablación del aleteo auricular típico.
Métodos: Se ha analizado de manera consecutiva a 95 pacientes remitidos para ablación del istmo cavotricuspídeo. Se realizó un ecocardiograma en las 6 h posteriores al procedimiento y al cabo de 1 año de seguimiento.
Resultados: Completaron el estudio 89 pacientes. La cardiopatía hipertensiva fue la asociada más frecuentemente (39%). Presentaban disfunción sistólica ventricular izquierda el 24% de los pacientes. Se observó una reducción estadísticamente significativa en el área de la aurícula derecha, el área de la aurícula izquierda, los diámetros telediastólico y telesistólico del ventrículo izquierdo y el septo interventricular. Hubo una mejoría significativa en la fracción de contracción de la aurícula derecha y la fracción de eyección del ventrículo izquierdo, así como en la reducción de hipertensión pulmonar. Se observó un cambio significativo en el patrón de disfunción diastólica, que pasó de grado III (60% basal) a grado I (el 81% en el seguimiento). No se encontraron diferencias estructurales basales ni en el seguimiento entre los pacientes con aleteo auricular paroxístico o persistente, excepto en la función diastólica basal.
Conclusiones: La ablación con catéter del istmo cavotricuspídeo en el aleteo auricular típico produjo al cabo de 1 año de seguimiento un remodelado cardiaco inverso estructural y funcional, con mejoría de la fracción de eyección del ventrículo izquierdo, la fracción de contracción de la aurícula derecha y el patrón de disfunción diastólica.

* Corresponding author: Servicio de Cardiología, Hospital Clínico de Santiago, Travesía Choupana s/n, 15706 Santiago de Compostela, A Coruña, Spain.
E-mail address: Javier.Garcia.Seara@sergas.es (J. García-Seara).

1885-5857/$ – see front matter
http://dx.doi.org/10.1016/j.rec.2012.03.023

Abbreviations

AFib: atrial fibrillation
AFl: atrial flutter
CTI: cavotricuspid isthmus
LA: left atrium
LVEF: left ventricular ejection fraction
RA: right atrium

INTRODUCTION

Cavotricuspid isthmus (CTI) ablation is a front-line option in the treatment of typical recurrent atrial flutter (AFl), especially in patients with poor clinical tolerance and in those who develop AFl following treatment of atrial fibrillation (AFib) with class I or III drugs.[1–4] Improvements in symptoms and quality of life have been reported following CTI ablation,[5–9] but post-ablation structural and functional changes have not been studied.

The present study was designed to determine the structural and functional cardiac changes that occur at 1 year in patients with typical AFl following CTI ablation.

METHODS

Population

We analyzed 95 consecutive patients referred to the cardiac electrophysiology laboratory between 2003 and 2005 who met the following requirements: *a)* age≥ 18 years; *b)* ≥1 AFl episodes documented in 12-lead electrocardiogram (ECG) in the previous 6 months; *c)* a history of isolated or predominant AFl if presenting with concomitant AFib, or AFl after antiarrhythmic treatment with type I or III drugs for AFib prevention, and *d)* electrophysiologic confirmation of CTI-dependent AFl or CTI permeability if the ablation procedure was performed in sinus rhythm, in which case, the clinical episode ECG had to show this was of the common type.

Exclusion criteria were: *a)* non CTI-dependent AFl; *b)* cardiac surgery or interventional cardiac procedure (coronary angioplasty or pacemaker implantation) in the previous 30 days; *c)* implantable cardioverter-defibrillator recipient; *d)* life expectancy<1 year, and *e)* inability to complete the quality of life questionnaire (Figure).

Definitions

Tachycardia-induced cardiomyopathy: left ventricular (LV) myocardial dysfunction secondary to AFl with high frequency ventricular response and total recovery on achieving normal cardiac rhythm. We defined LV systolic dysfunction as <50% left ventricular ejection fraction (LVEF). Patients who did not achieve normal LVEF in the follow-up were not considered to have tachycardia-induced cardiomyopathy.

AFl types were defined by analogy with AFib:

- Persistent: incessant AFl which does not cease spontaneously, continuing over >1 month and documented in several ECGs.
- Paroxysmal: intermittent AFl with episodes of <48 h that remit spontaneously.

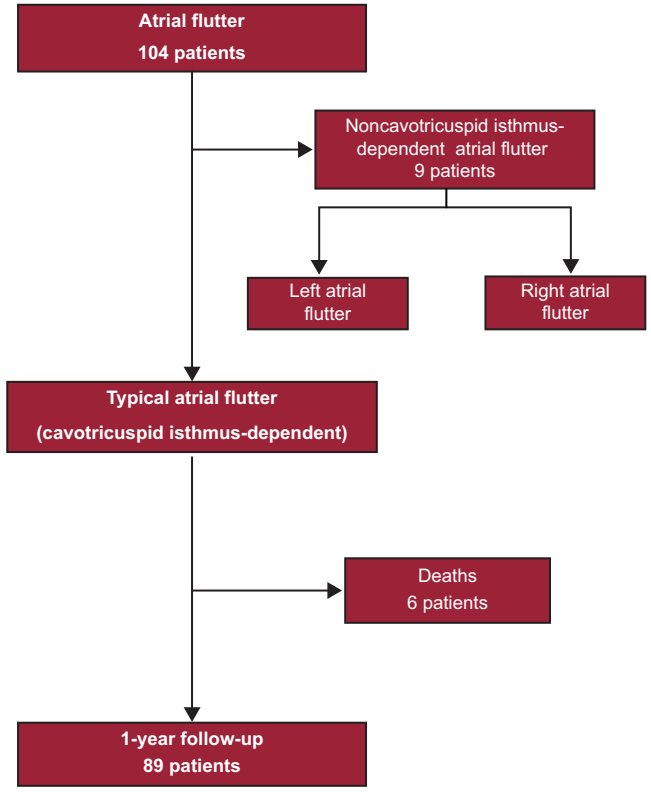

Figure. Flow-chart of the study population.

Ablation Procedure

We used a standard quadripolar catheter (Usci-Bard Inc.) to map the His bundle region, a decapolar catheter (Usci-Bard Inc.) to map the coronary sinus, and a duodecapolar Halo XP catheter (Cordis-Webster Inc.) to map activation of the right atrium (RA) anterolateral wall. Radiofrequency energy was applied for a period of 60 s at each point. CTI-dependency was confirmed by entrainment when the rhythm at the start of the electrophysiology study was AFl or when AFI was induced in the laboratory. If the patient was in sinus rhythm, bidirectional CTI permeability was confirmed prior to ablation. The objective of the procedure was to achieve bidirectional CTI conduction block.[10,11]

Follow-up

Clinical follow-up was programmed for all patients at 3, 6 and 12 months after ablation. Any visit to either a cardiologist or the emergency department was recorded in the patient's online clinical history. At 6 months post-procedure, a 7-day Holter monitor was used to assess asymptomatic events.

An echocardiographic study with standard equipment (Siemens Sequoia C 256 AG; Munich, Germany) was made at ≤6 h after the electrophysiology study and at 1-year follow-up. M-mode and bidimensional mode measurements were made in line with American Society of Echocardiography recommendations.[12] RA and left atrium (LA) areas were calculated by mapping the internal borders of the atrium in the apical 4-chamber plane to obtain maximum atrium size at ventricular end-systole. The same method was used to calculate minimum RA area at ventricular end-diastole and RA contraction fraction (RAcf) using the following formula:

$$\text{RAcf} = (\text{diastolic RA area} - \text{systolic RA area})/\text{diastolic RA area}$$