Table
Sample Characteristics (n = 42)

Women	13 (31)
Age, mean (SD), y	54 (11)
Paroxysmal AF	34 (81)
History of AF, y	5.4 [1-23]
Hypertension	22 (54.6)
Diabetes mellitus	5 (12)
Dyslipidemia	17 (40.6)
Tobacco use	
Active smokers	4 (9.5)
Ex-smokers	13 (31)
BMI, mean (SD)	27.5 (3)
CHA_2DS_2–VASc, mean (SD)	1.13 (1.1)
CrCl, mean (SD), mL/min	86 (26)
Treatment	
Beta-blockers	24 (57.6)
Flecainide	21 (50)
Propafenone	2 (4.8)
Dronedarone	2 (4.8)
Amiodarone	14 (33.3)
Dicoumarol-derived anticoagulants	20 (47.6)
NOAC	8 (19)
Acetylsalicylic acid	6 (14.3)
LVEF, mean (SD), %	62.52 (8.3)

AF, atrial fibrillation; BMI, body mass index; CrCL, creatinine clearance; LVEF, left ventricular ejection fraction; NOAC, new oral anticoagulants; SD, standard deviation.
Unless otherwise indicated, the data are expressed as No. (%) or median [range].

patients. Isolation of 89% of the pulmonary veins was achieved after completion of the first ablation line. The structure requiring the greatest number of applications was the left common pulmonary vein. Comparison of the procedure times of the first 6 and last 6 months revealed a reduction in fluoroscopy time (46 minutes vs 36 minutes; $P = .05$), but no change in the total procedure time.

Three patients developed uncomplicated hematomas and 1 (2%), a femoral pseudoaneurysm requiring surgical treatment; 1 patient (2%) developed cardiac tamponade that required pericardiocentesis; phrenic paralysis was detected in 4 patients (9.5%) during the procedure. This complication arose during the first 18 procedures, but there were no new cases in the remainder of the interventions. This was due to the cumulative experience, specifically in the care taken to apply the energy as close as possible to the antrum, avoiding the exertion of excessive pressure by the balloon on the right veins (especially the superior vein), so that the atrial wall not be pushed closer to the phrenic nerve. In 2 patients, esophageal temperature rose (39.5 °C) during the application of the laser in the left superior pulmonary vein, requiring interruption of the application. In both cases, isolation could be completed by reducing the power and modifying the ablation line.

This single-center, prospective study reports the first use of laser energy for electrical pulmonary vein isolation in Spain. The results obtained (isolation of 99% of the mapped veins, with 2 serious complications but no mortality associated with the technique) are positive and agree with those published by other authors, considering that the study period included the learning curve.[6] The adaptability of the balloon catheter was excellent and, thus, ablation of most of the veins and all of the venous trunks was achieved.

The main limitations of this study are its single-center design and small sample size. Moreover, it assesses acute data on both efficacy and safety, but extended follow-up periods will be necessary to estimate the long-term efficacy of the technique.

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REFERENCES

1. Camm J, Lip GYH, de Caterina R, Savelieva I, Atar D, Hohnloser SH, et al. 2012 focused update of the ESC Guidelines for the management of atrial fibrillation. Eur Heart J. 2012;33:2719–47.
2. Calkins H, Kuck KH, Cappato R, Brugada J, Camm AJ, Chen SA, et al. 2012 HRS/EHRA/ECAS expert consensus statement on catheter and surgical ablation of atrial fibrillation. Europace. 2012;14:528–606.
3. Reddy VY, Neuzil P, Themistoclakis S, Danik SB, Bonso A, Rossillo A. Visually-guided balloon catheter ablation of atrial fibrillation: experimental feasibility and first-in-human multicenter clinical outcome. Circulation. 2009;120:12–20.
4. Dukkipati SR, Neuzil P, Kautzner J, Petru J, Wichterle D, Skoda J, et al. The durability of pulmonary vein isolation using the visually guided laser balloon catheter: multicenter results of pulmonary vein remapping studies. Heart Rhythm. 2012;9:919–25.
5. Dukkipati SR, Kuck KH, Neuzil P, Woollett I, Kautzner J, McElderry HT, et al. Pulmonary vein isolation using a visually guided laser balloon catheter: the first 200-patient multicenter clinical experience. Circ Arrhythm Electrophysiol. 2013;6:467–72.
6. Ferrero A, Díaz-Infante E, Macías A. en representación de los colaboradores del Registro Español de Ablación con Catéter. Registro Español de Ablación con Catéter. XII Informe Oficial de la Sección de Electrofisiología y Arritmias de la Sociedad Española de Cardiología (2012). Rev Esp Cardiol. 2013;66:983–92.

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Prediabetes, Diabetes and Left Heart Deformation

Prediabetes, diabetes y deformación del corazón izquierdo

To the Editor,

Type 2 diabetes mellitus is commonly associated with hypertension and dyslipidemia. These disorders are risk factors for left ventricular (LV) remodeling, which represents one of the preconditions for the development of heart failure.[1] Several studies using 2-dimensional (2D) speckle tracking have shown that LV myocardial deformation is also impaired in diabetic patients.[2–4] To our knowledge, no research has comprehensively investigated 2D and 3-dimensional (3D) left heart deformation in persons with prediabetes and diabetes.

Our goal was to investigate LV and left atrial (LA) deformation in prediabetic and diabetic persons using 2D and 3D strain, and to examine the relationship between left heart mechanics and parameters of glycemic control in this population.

Our study included 114 untreated persons aged < 65 years, divided into 3 groups: 38 persons with prediabetes, 38 recently

Table 1
Demographic Characteristics and Clinical Parameters of Study Population

	Controls (n = 38)	Prediabetes (n = 38)	Diabetes (n = 38)	P
Age, mean (SD), y	51 (6)	52 (7)	53 (7)	NS
Women	18 (47)	18 (47)	18 (47)	NS
BMI, mean (SD), kg/m^2	24.5 (2.1)[a,b]	26.7 (3.3)[a]	27.5 (2.3)[b]	<.001
Clinic SBP, mean (SD), mmHg	124 (11)	126 (12)	128 (11)	NS
Clinic DBP, mean (SD), mmHg	71 (7)	73 (7)	75 (8)	NS
Fasting plasma glucose, mean (SD), mmol/L	4.6 (0.8)	6.4 (0.5)	7.7 (0.9)	<.001[c]
HbA_{1c}, mean (SD), %	4.7 (0.7)	6 (0.4)	7.8 (1.2)	<.001[c]
Serum creatinine, mean (SD), umol/L	62 (9)[a,d]	65 (10)[d]	67 (11)[a]	NS
Triglycerides, mean (SD), mmol/L	1.4 (0.4)	1.8 (0.5)	2.1 (0.5)	<.001[e]

BMI, body mass index; DBP, diastolic blood pressure; HbA_{1c}, glycated hemoglobin; SBP, systolic blood pressure; SD, standard deviation.
[a] Controls vs prediabetic patients ($P < .01$).
[b] Controls vs diabetic patients ($P < .01$).
[c] $P < .01$ in comparisons between any 2 groups.
[d] Prediabetic vs diabetic patients ($P < .01$)
[e] $P < .05$ in comparisons between any 2 groups.
Unless otherwise indicated, the data are expressed as no. (%).

diagnosed diabetic patients, and 38 healthy participants free of cardiovascular risk factors. In line with current guidelines, prediabetes and diabetes were defined by levels of fasting blood glucose and glycated hemoglobin (HbA_{1c}). Participants in all 3 groups were matched by sex and age.

All participants underwent a complete 2D and 3D echocardiographic examination using a Vivid 7 ultrasound machine. The 2D LV and LA longitudinal strain was calculated by averaging all the values of the regional peak longitudinal strain obtained in 2-chamber and 4-chamber apical views. The 2D LV circumferential strain and radial strain were obtained as the average of the LV 6 regional values measured at the level of the papillary muscles. The 3D LV mechanical parameters, global longitudinal, circumferential, radial and area strain were calculated as the averages of the regional values from the 17 myocardial segments at end-systole.

A multivariate regression analysis included body mass index, transmitral E/A ratio, 2D LV and LA longitudinal strain, 2D LV mass index, and 3D LV area strain.

The results showed that there was no difference in blood pressure levels between the observed groups, whereas fasting glucose levels and HbA_{1c} progressively increased from the controls to the diabetic patients (Table 1). The LV mass index was greater in diabetic patients than in controls and persons with prediabetes

Table 2
Echocardiographic Parameters of the Left Ventricle and Left Atrium in the Study Population (2- and 3-Dimensional Echocardiography Assessment)

	Controls (n = 38)	Prediabetes (n = 38)	Diabetes (n = 38)	P
2D LV and LA parameters				
LA volume/BSA, mean (SD), mL/m^2	24 (4)	25 (5)	26 (5)	NS
LV end-diastolic volume/BSA, mean (SD), mL/m^2	52 (8)	51 (7)	53 (8)	NS
LV end-systolic volume/BSA, mean (SD), mL/m^2	19 (4)	19 (3)	20 (4)	NS
Interventricular septum thickness, mean (SD), mm	10 (0.9)[a]	10.3 (1.2)	10.9 (1.7)[a]	.011
LV mass/Ht$^{2.7}$, mean (SD), g/m$^{2.7}$	37.4 (3.1)[b]	39.2 (3.5)[c]	41.7 (4)[b,c]	<.001
Ejection fraction, mean (SD), %	63 (5)	63 (4)	62 (4)	NS
E/A_m ratio	1.2 (0.23)[b]	1.1 (0.25)	1.03 (0.17)[b]	.001
2D LV and LA mechanical parameters				
LV longitudinal strain, mean (SD), %	-21.4 (1.6)[b,d]	-20 (1.5)[d]	-19.6 (1.5)[b]	<.001
LV circumferential strain, mean (SD), %	-22 (2.3)[a]	-21.4 (2)	-20.5 (2.4)[a]	.015
LV radial strain, mean (SD), %	46.1 (12)	44.5 (11.2)	43 (11.3)	NS
LA longitudinal strain, mean (SD), %	40.4 (6.5)[a]	38.3 (6.2)	36.5 (6)[a]	.028
3D LV mechanical parameters				
Global longitudinal strain, mean (SD), %	-19.5 (2.3)[b,d]	-18.1 (2)[d]	-17.4 (2.2)[b]	<.001
Global circumferential strain, mean (SD), %	-20.9 (3)[b]	-19.6 (2.8)	-18.3 (2.6)[b]	<.001
Global radial strain, mean (SD), %	43.7 (6.8)[a]	42.2 (6.6)	39.8 (6.1)[a]	.032
Global area strain, mean (SD), %	-30.4 (4)[b,d]	-28.1 (3.8)[d]	-27.5 (3.5)[b]	.002

A_m, late diastolic mitral flow (pulse Doppler); 2D, 2-dimensional; 3D, 3-dimensional; BSA,body surface area; E, early diastolic mitral flow (pulse Doppler); Ht, height; LA, left atrium; LV, left ventricle; SD, standard deviation.
[a] Controls vs diabetic patients ($P < .05$).
[b] Controls vs diabetic patients ($P < .01$).
[c] Prediabetic vs diabetic patients ($P < .01$).
[d] Controls vs prediabetic patients ($P < .05$).

(Table 2). LV diastolic function estimated by transmitral E/A ratio was significantly impaired in diabetic patients compared with controls (Table 2).

Two- and 3D LV longitudinal mechanical function was increased in the controls compared with the other 2 groups. Two- and 3D LV circumferential, together with 2D LA longitudinal strain were decreased in the diabetic patients compared with controls. Two-dimensional LV radial strain did not differ between the 3 groups, whereas 3D LV radial strain was lower in diabetic patients than in controls (Table 2). Three-dimensional LV area strain was lower in the prediabetic and diabetic patients than in the controls (Table 2).

The multivariate regression analysis demonstrated that 2D LV mass index (β = 0.38; $P < .01$), 2D LA longitudinal strain (β = -0.3; $P = .01$) and 3D LV area strain (β = -0.37; $P < .01$) were independently associated with HbA_{1c} in the whole study population.

Our investigation revealed several new findings: *a)* 3D LV myocardial deformation in all directions is deteriorated in diabetic patients; *b)* prediabetic patients have decreased 2D LV longitudinal strain, as well as 3D longitudinal and area strain; *c)* 2D LA longitudinal strain is decreased in diabetic patients; and *d)* 2D and 3D parameters of left heart mechanics are independently associated with glycemic control, assessed by HbA_{1c}.

Recently published studies have shown that 2D LV and LA strain are strong predictors of cardiovascular morbidity and mortality in the general population and in diabetic patients. Ernande et al[2,4] showed that 2D longitudinal and radial functions of each LV segment are impaired in diabetic participants; Ng et al[3] found that only 2D longitudinal deformation was reduced in diabetic patients, whereas circumferential and radial strain were preserved. Ceyhan et al[5] have published the first report that persons with impaired glucose tolerance have decreased LV systolic strain and strain rate, as well as early diastolic strain rate compared with controls. Our results confirm previous findings and add a new piece of evidence: namely, we found that 2D LV circumferential strain, in addition to longitudinal function, is also deteriorated in diabetic patients. Additionally, 3D speckle tracking revealed that LV mechanical deformation is impaired in all directions, along with area strain, which represents a combination of longitudinal and circumferential strain. Our findings demonstrate that LV systolic function, together with diastolic function, is impaired long before the occurrence of cardiac symptoms.

Zhang et al[6] showed that well-controlled diabetic patients have a decreased 3D strain in all directions, which completely confirms our results. The authors also found that HbA_{1c} was independently associated with all components of 3D LV strain. Our model of stepwise multivariate regression was different, and revealed that 2D LV and LA longitudinal strain, as well as 3D LV area strain, were independently associated with HbA_{1c}.

Further analyses are necessary to evaluate the predictive value of 2D, and especially of 3D strain, on cardiovascular morbidity and mortality in prediabetic and diabetic patients.

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REFERENCES

1. Rojo-Martínez G, Valdés S, Colomo N, Lucena MI, Gaztambide S, Gomis R, et al. Consumo de fármacos relacionados con el tratamiento de la diabetes mellitus y otros factores de riesgo cardiovascular en la población española. Estudio Di@bet.es. Rev Esp Cardiol. 2013;66:854–63.
2. Ernande L, Bergerot C, Rietzschel ER, de Buyzere ML, Thibault H, Pignonblanc PG, et al. Diastolic dysfunction in patients with type 2 diabetes mellitus: is it really the first marker of diabetic cardiomyopathy? J Am Soc Echocardiogr. 2011;24:1268–75.
3. Ng AC, Delgado V, Bertini M, van der Meer RW, Rijzewijk LJ, Shanks M, et al. Findings from left ventricular strain and strain rate imaging in asymptomatic patients with type 2 diabetes mellitus. Am J Cardiol. 2009;104:1398–401.
4. Ernande L, Rietzschel ER, Bergerot C, de Buyzere ML, Schnell F, Groisne L, et al. Impaired myocardial radial function in asymptomatic patients with type 2 diabetes mellitus: a speckle-tracking imaging study. J Am Soc Echocardiogr. 2010;23:1266–72.
5. Ceyhan K, Kadi H, Koç F, Celik A, Oztürk A, Onalan O. Longitudinal left ventricular function in normotensive prediabetics: a tissue Doppler and strain/strain rate echocardiography study. J Am Soc Echocardiogr. 2012;25:349–56.
6. Zhang X, Wei X, Liang Y, Liu M, Li C, Tang H. Differential changes of left ventricular myocardial deformation in diabetic patients with controlled and uncontrolled blood glucose: a three-dimensional speckle-tracking echocardiography-based study. J Am Soc Echocardiogr. 2013;26:499–506.

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Thrombosis of a Mechanical Tricuspid Valve Prosthesis Resolved With Fibrinolysis

Trombosis de prótesis tricuspídea mecánica resuelta con fibrinolisis

To the Editor,

Implantation of a mechanical prosthesis in the tricuspid position is uncommon because most of the patients with disease in this valve choose to undergo repair consisting of annuloplasty. When mechanical prostheses are implanted in the tricuspid position, the risk of thrombosis is greater than that associated with these devices in left chambers, as the flow is slower in the right chambers and the pressure is lower. Currently, there is little literature on prosthetic tricuspid valve thrombosis and its treatment.

We report the case of a 52-year-old woman, with congenital atrioventricular block, who had undergone implantation of a dual-chamber pacemaker in 1986 and developed a pressure ulcer that required deepening of the pocket in 1989. Lead dysfunction occurred in 1996, and a new system was implanted, but the leads from the previous system were not withdrawn. In March 2013, she was diagnosed with severe tricuspid stenosis due to leaflet fibrosis, secondary to the leads that passed through the valve, and a 27-mm St. Jude Masters double-disc mechanical prosthesis was implanted. During the follow-up period, while asymptomatic, she reported that she no longer could hear the sounds of the prosthesis, and auscultation detected an increase in the intensity of the murmur during tricuspid filling. Doppler ultrasound revealed an increase in the atrioventricular pressure gradient across the tricuspid valve, and 3-dimensional transesophageal echocardiography demonstrated the immobility of one of the leaflets produced by a