

or DTI tricuspid annulus < respectively 10.1 cm/s to 6.09 cm/s and 12.75 cm/s. Echocardiographic parameters predictive of cardiac events overall were: SPAP > 42 mm Hg, a TAPS < 11.5, a FRSRV < 38%, Sa and Aa waves to the DTI tricuspid lower respectively at 10.2 cm/s and 14 cm/s. In multivariate analysis, only the FRSRV < 38% was a factor directly related to the occurrence of cardiac events overall. **Conclusion.**— In current practice, assessment of the prognosis of patients with DCM is limited to consideration of the left ventricle. The evaluation of echocardiographic parameters of systolic and diastolic RV functions would be very useful for better stratification of prognosis of these patients.

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#### Left atrial volume as a morphophysiological expression of left ventricular diastolic dysfunction

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**Background.**— Left ventricular (LV) diastolic dysfunction is prevalent in the community.

Previous studies have reported an association between diastolic function and atrial dimension.

**Objective.**— The aim of this study is to evaluate the relation between left atrial (LA) volume and LV diastolic function.

**Methods and results.**— In the present prospective study of 120 adults, mean age  $59 \pm 4$  years, referred for a clinically-indicated echocardiogram and in sinus rhythm, with no history of atrial arrhythmias or valvular heart disease and with an ejection fraction > 50%, we determined the LA volume, LV diastolic function status.

The left atrial volume was calculated from the apical four-chamber and two-chamber views at ventricular endsystole with using Simpson's biplane method.

Diastolic dysfunction (DD) was found in 72% of classified patients. The LA volume indexed to body surface area (LAVi) increased with worsening DD: 23.8 mL/m<sup>2</sup> (normal), 29 mL/m<sup>2</sup> (grade I), 42.5 mL/m<sup>2</sup> (grade II) and 51.7 mL/m<sup>2</sup> (grades III). The LAVi was strongly associated with diastolic function grade ( $P < 0.001$ ).

**Conclusion.**— In patients without a history of atrial arrhythmias or valvular heart disease or an ejection fraction < 50%, LA volume expressed the severity of diastolic dysfunction.

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#### Effects of cardiac resynchronization therapy on mitral regurgitation severity

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**Objectives.**— We studied the effects of cardiac resynchronization therapy (CRT) on functional mitral regurgitation in heart failure (HF) patients.

**Background.**— Functional mitral regurgitation (FMR) is a common finding in patients with global left ventricular (LV) dilatation and dysfunction.

Several recent studies demonstrated that cardiac resynchronization therapy (CRT) might be able to reduce FMR.

**Methods.**— Twenty-nine patients with heart failure and FMR were studied after implantation of a biventricular CRT system. Clinical responders were predefined as survived patients with an improvement by one or more NYHA functional class.

tive regurgitant orifice area (EROA) and the regurgitant volume (RV).

**Results.**— Twenty-nine patients (mean age,  $66 \pm 8$  years; 26 men; mean LV ejection fraction  $25 \pm 7\%$ ) with severe HF were included. All patients were restudied at a mean of  $8 \pm 2$  months after CRT; 26 (89%) were clinical responders.

Cardiac resynchronization therapy was associated with a significant reduction in FMR severity in clinical responders; effective regurgitant orifice area (EROA) decreased from  $19 \pm 18$  mm<sup>2</sup> to  $8 \pm 7$  mm<sup>2</sup> ( $P < 0.001$ ) and regurgitant volume (RV) decreased from  $19 \pm 11$  mL/beat to  $10 \pm 9$  mL/beat ( $P < 0.001$ ). This was accompanied by a significant reduction in LV volumes and an increase in ejection fraction ( $P = 0.001$ ).

In clinical nonresponders, there was not a significant decrease in MR severity; EROA decreased from  $28 \pm 6$  mm<sup>2</sup> to  $22 \pm 13$  mm<sup>2</sup> ( $P = 0.18$ ) and RV from  $25 \pm 5$  mL/beat to  $22 \pm 8$  mL/beat ( $P = 0.18$ ).

**Conclusion.**— Functional mitral regurgitation is reduced in clinical responders to CRT. Thus, FMR may be an important factor influencing clinical response to CRT.

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#### Impact of betablocker, as a treatment of heart failure, on the echocardiographic parameters

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**Introduction.**— Little study analyzed the effect of betablocker on echocardiographic, functional parameters and the capacity of exercise in case of heart failure.

**Aim.**— To analyze the impact of betablocker on several clinical, functional, echocardiographic, biochemical parameters, and to define predictive factors of improvement.

**Methods.**— Our study is prospective between August 2009 and June 2010 including patients followed in cardiology department of Hédi Chaker hospital for steady heart failure due to left ventricular systolic dysfunction. Patients benefited a clinical, functional (NYHA class, TM6M, Minnesota score), echocardiographic assessment and a dosage of the NT-proBNP before taking bisoprolol, and 3 months after the tolerated maximal dose.

**Results.**— Forty patients have been included in the study. The mean age was of  $61,15 \pm 9,86$  years, the sex-ratio was 9. The heart failure was ischemic in 70% of cases. The mean dose of bisoprolol was  $5,375 \pm 0,75$  mg. The tolerance to the betablocker was good at 70% of patients. A transient aggravation of the effort dyspnea has been noted at 10% of patients. Only one death occurred in the outside of the phase of titration. A reduction of the heart rate has been noted ( $P = 0,08$ ). No meaningful elongation of the QRS and the QT has been noted. The NYHA class ( $P < 0,001$ ) and the TM6M improved of meaningful way ( $P < 0,001$ ). The left ventricle ejection fraction (LVEF) improved at 72,5% of patients. The average of the (LVEF) passed of  $29,44 \pm 6,51$  to  $34,49 \pm 6,9$ ;  $P < 0,001$ . Diastolic function improved of meaningful way at 33% of patients with improvement of the mitral profile ( $P = 0,08$ ) and of replenishment pressures ( $P = 0,06$ ). A meaningful improvement of the right ventricle function has been noted at 17,9% of patients. In univariate analysis, the heart rate < 76 bpm, the width of the QRS, a LVEF < 30, 5% were predictive of improvement of the LVEF. The E/Ea ratio was predictive of diastolic function improvement and no predictive factor of improvement of the right ventricle function has been recovered.

**Conclusion.**— The bisoprolol permitted to improve clinical, functional, echocardiographic parameters and to decrease the NT-proBNP of meaningful way.

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### Echocardiographic assessment in 1578 patients with chronic heart failure

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**Introduction.**— In patients with chronic heart failure, echocardiography provides important information on the mechanism of heart failure (HF) and defining the severity of the disease.

The aim of our study is to identify the echocardiographic characteristics of patients with chronic heart failure (CHF), and to determine the predictors of improvement of echocardiographic parameters.

**Materials and methods.**— This was a single centre, observational study. We included 1578 patients followed for CHF (heart failure which had lasted for more than 1 year) in Ibn Rochd Center of Cardiology from May 2006 to October 2010. All patients had a complete Doppler echocardiographic examination and all parameters were analysed. During follow-up, we defined an improvement of echocardiographic parameters by an increase of left ventricular ejection fraction > 5% compared to baseline, change in cardiac filling pressures assessed by Doppler echocardiography from restrictive to non-restrictive pattern and decrease of RVSP by more than 20% compared to baseline.

**Results.**— The mean age of our patients was  $64.82 \pm 10.12$  years (16–100), and 64% were men. CHF was due to ischaemic heart disease in 55%. Mean left ventricular ejection fraction (LVEF; biplane Simpson method) was 35% (10–69%). LVEF was  $\leq 35\%$  in 897 patients (57%), 35–50% in 505 patients (32%), and  $\geq 50\%$  only in 176 patients (11%). Mean Left ventricular end diastolic diameter (LVEDD) was 58 mm (32–89), restrictive mitral inflow was found in 21% of patients and high LV filling pressures in 30% of patients. Pulmonary arterial systolic pressure was more than 35 mmHg in 22% of patients. The predictors of improvement in echocardiographic data were female sex, sinus rhythm and high doses of diuretics.

**Conclusion.**— Echocardiography is well qualified to meet the growing need for non-invasive imaging in the HF population. In fact, echocardiography provides important data for therapeutic decision-making and improves the outcome of patients with CHF.

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### Predictors of outcome in 369 patients with heart failure with preserved ejection fraction

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**Introduction.**— A heart failure with preserved ejection fraction (HFPEF) is present in half the patients with heart failure (HF); the prognosis in more recent studies has been shown to be essentially similar to that of systolic HF. The objective of our study is to define the clinical, biological and echocardiographic predictors of outcome in patients with HFPEF.

**Patients and methods.**— We included 1548 patients, admitted in Ibn Rochd Center of Cardiology from May 2006 to October 2010. HFPEF was defined as LVEF  $\geq 45\%$ ; and receiving a loop diuretic for breathlessness. All patients were evaluated clinically with monitoring of blood pressure (BP), 6-min walk test and electrocardiogram. Two-dimensional echocardiography and laboratory tests were performed in all patients.

**Results.**— Of 1548 patients, 369 (24%) had HFPEF; the median age was 66 years (42–94) and 61.9% were men. 49.2% of the patients were hypertensive and 33% were diabetic, and 61.9% were in NYHA class II, and 23.8% were in NYHA class III. The median of 6-min walk test was 118 m. The mean LVEF was 49% (45–74). Hypertensive (44.4%) and ischemic heart disease (17.46%) remain the two most frequent etiologies. During a median follow-up of 32 months, mortality was 16%. By univariable analysis, NYHA class; 6-min walk distance; atrial fibrillation and systolic pulmonary artery pressure (sPAP) were associated with an adverse prognosis.

In multivariable analysis, increasing age, NYHA class, and renal failure were predictors of adverse prognosis; betablockers treatment, increasing Hb and female sex were predictors of a better outcome.

**Conclusion.**— As several studies, clinical and biological variables were more powerful predictors of outcome in HFPEF than echocardiographic variables which are recommended to identify diastolic function.

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### Not only E/Ea ratio during exercise but arterial compliance correlates with six-minute walking test in patients with heart failure with normal ejection fraction

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**Purpose.**— Although heart failure with normal ejection fraction (HFNEF) is a frequent disease, physiopathologic mechanisms are still controversial. We hypothesized that elevated arterial stiffness and impaired diastolic reserve could explain symptoms at exercise.

**Methods.**— From our heart failure clinic (614 patients), we selected 85 patients with a HFNEF syndrome (ESC 2007 criteria). Thirty-two were on sinus rhythm and could perform an echocardiography at rest and peak exercise with measurement of diastolic transmitral parameters (E and A), and tissue Doppler velocities (early diastolic Ea, and systolic Sa). Central arterial stiffness parameters were assessed noninvasively by tonometry: carotidofemoral pulse wave velocity (PWVcf), central pulse pressure (PP), and Augmentation Index (AIx@75). Distance during a six-minute walking test (6MWT) and a semi-quantitative assessment of peak exercise dyspnoea evaluated functional performances.

**Results.**— Mean age was  $76 \pm 11$  years, with a high prevalence of hypertension (66%). PWVcf was increased at  $10 \pm 2.3$  m/s, and distance at 6MWT was  $373 \pm 114$  m. In univariate analysis, distance correlated with PWVcf ( $R = -0.82$ ,  $P < 0.0001$ ), heart rate at rest ( $R = -0.39$ ,  $P = 0.045$ ), and E/Ea at rest ( $R = -0.48$ ,  $P = 0.012$ ) but almost at peak exercise ( $R = -0.61$ ,  $P < 0.01$ ). Exertional dyspnoea correlated with PWVcf too ( $P = 0.025$ ), and with diastolic and systolic parameters measured at peak exercise (E/Ea:  $P = 0.02$ ; Sa:  $P = 0.014$ ). In multivariate analysis, PWVcf was the strongest predictor of distance at 6MWT, with a lower influence of heart rate, and no significant influence of diastolic and systolic functions.

**Conclusion.**— In HFNEF, different interlinked mechanisms can lead to functional limitation and dyspnoea at exercise, but central arterial compliance and ventricular-arterial coupling impairment play a key role.