was defined as hyperemic peak diastolic LAD flow velocity divided by baseline flow velocity (normal value >2) and FFR was defined as distal pressure divided by mean aortic pressure during maximal hyperemia (normal value >0.8).

Results.— The mean FFR and CFR were 0.84±0.07 and 2.7±0.75 respectively, in the whole population. Concordant results between FFR and CFR were seen in 44 cases (88%) and discordant results in six cases (12%). There was a significant correlation between CFR and FFR (r = 0.59, P < 0.01). A better correlation was found between CFR and % LAD diameter stenosis, and lesion length (all, P < 0.05), than between CFR and the same anatomic markers of stenosis severity (all, P = NS). The sensitivity, specificity, positive and negative predictive values of CFR more than 2 to detect a non significant lesion defined by a normal FFR were 95, 69, 90, and 82%, respectively.

Conclusion.— In pts with LAD stenosis of IS, discordant results between non-invasive CFR and FFR were not unusual, and the anatomic determinants of the stenosis are better correlated to FFR than to CFR. However, CFR which is a global evaluation of the coronary tree has a very high sensitivity to detect a non significant lesion, despite the high prevalence of vascular risk factors.

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Interest of atrial contractile function’s study in coronary heart disease
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Introduction.— Assessment of myocardial systolic and diastolic function is a primary objective in a perspective diagnosis, prognosis and therapy of ischemic heart disease. Based on the concept postulating that myocardial ischemia impairs diastolic function earlier than systolic function and since the atrial contraction is an integral part of diastolic function, it is legitimate to be interested in studying the atrial function in assessing diastolic function of ischemic cardiomyopathy.

Objective.— The aim of our work is to study in coronary patients the intake of conventional echocardiography and of pulsed doppler tissue imaging (DTI) in the evaluation of atrial contractile function.

Materials and methods.— Prospective study in 60 patients hospitalized for coronary heart disease that we compared to 40 witnesses. All the subjects have undergone a conventional echocardiography. Only the patients have a coronary angiography. We investigated the conventional echocardiographic parameters of the two atria namely lateromedian and supero-inferior diameters, atrial surfaces before and after atrial contraction, atrial volumes, fractional shortening (S-FE) and the fraction of ejection (V-FE) atrial. With pulsed DTI we measured peak velocity of atrial contraction (Va) at the free wall of the right atrium (Va-RA), the left atrium (Va-LA) and in the inter-atrial septum (Va-IAS). We studied the electromechanical delay of the onset, the peak and the end of atrial contraction by measuring respectively the time between the beginning of the P wave and the onset, the peak and the end of atrial contraction.

Results.— The mean age was 53.5 years ± 10.9 (26,76) comparable to the average age of witnesses. Ninety percent of the population was male. The conventional echocardiography study showed an increase in atrial dimensions associated to the reduction of fractional shortening (22.5 ± 12.1% vs. 32.7 ± 12.8%, P < 0.001) and ejection (35.8 ± 16.5% vs. 50.9 ± 11.9%, P < 0.001) of both atria in coronary patients compared with healthy subjects. Va was similar in the free wall of the RA and LA (P = 0.1) and less on the IAS (P = 0.001) respectively 14.9 ± 3.5 cm/s, 14.1 ± 3.8 cm/s and 10.9 ± 2.6 cm/s. In coronary patients, there are a significant decrease in the rate of atrial contraction in the three atrial sites (Va-LA: 11.5 ± 4 cm/s vs. 14.1 ± 3.8 cm/s; Va-RA: 12.4 ± 3.7 cm/s vs. 14.9 ± 3.5 cm/s; Va-IAS: 8.8 ± 2.7 cm/s vs. 10.9 ± 2.6 cm/s, P < 0.001). Similarly, there’s a significant lengthening (P < 0.001) in the electromechanical delay affecting the onset (RA: 67.3 ± 17.9 ms vs. 50 ± 11.9 ms; IAS: 73.1 ± 18.3 ms vs. 59.3 ± 15.9 ms; LA: 81.3 ± 17.7 ms vs. 55.4 ± 13.1 ms), the peak (RA: 127.2 ± 110.3 ± 23 ms vs. 27 ms; IAS: 130.2 ± 18, 3 ms vs. 120.± 17.4 ms; LA: 138.1 ± 17.3 ms vs. 126.8 ± 17.4 ms) and the end (RA: 196.8 ± 25.7 ms vs. 175.6 ± 25.3 ms; IAS: 195 ± 22.2 ms vs. 179.6 ± 16.4 ms; LA: 195.5 ± 22.8 ms vs. 177.6 ± 23 ms) of the atrial contraction. We found that the Va-LA: is independent of the presence or absence of a transmural myocardial infarction. The decrease of Va-LA below 10 cm/s is for a breach of the anterior interventricular coronary artery.

Conclusion.— The atrial contractile dysfunction on echocardiography can help to establish the positive diagnosis of myocardial ischemia and to assess its severity. Pulsed DTI can make a better understanding of the impact of coronary heart disease on the sequence of mechanical atrial contraction. New techniques (strain, 3D echo) could improve the contribution of the study of atrial function in ischemic heart disease.

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Prediction of exercise capacities and cardiac involvement in scleroderma patients using a novel Doppler echocardiographic parameter
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Background.— The heart is one of the major organs involved in scleroderma, and the presence of cardiac injury usually portends poor prognosis. Ischaemia and fibrosis are the major mechanisms involved in scleroderma heart disease, and early detection is important. Echocardiography with modern ultrasound modalities such as tissue Doppler imaging (TDI) and 2D strain is considered as the best method for routine cardiac assessment, showing left and right ventricular systolic and diastolic function, pulmonary hypertension, and pericardial involvement. Besides, conduction defects are common in scleroderma, and among them, interatrial block (IAB) has been reported as a mark of atrial involvement.

Aims of the study.— To assess the prevalence of IAB by measuring the inter atrial electro-mechanical delay (IAMD) in scleroderma patients using TDI; to evaluate the correlation between IAMD and clinical, biological, and other echo-Doppler parameters.

Methods.— Patients with systemic sclerosis were selected if there were in sinus rhythm and were able to walk. The following data were collected: type and duration of the disease, NYHA functional class and distance walked in six minutes (6 WD), P wave duration on ECG, serum creatinine and NT proBNP levels. Echo-Doppler study comprised: left ventricular (LV) mass, LV systolic function (LVF: biplane Simpson’s method), LV diastolic function (mitral E and A waves velocities, E/A and E/e’ ratios), right ventricular (RV) function (TAPSE), pulmonary artery pressure (tricuspid regurgitation velocity—TRv), left atrial (LA) volumes and function (Simpson’s method). IAMD was assessed using colour TDI study, by measuring the delay between annular tricuspid and mitral a’ waves. A cut off value of 35 ms was chosen to define the presence of an IAB.

Results.— Forty patients were studied. Scleroderma was of the limited type in 32 patients, and of the diffuse type in 8. Forty percent of patients were found to have IAB at Doppler study. These patients were significantly older. After adjustment for age, they had more severe symptoms, lower 6 WD, higher NT proBNP and creatinine levels, and longer P wave duration than patients without IAB. No difference was found regarding LV dimension and LVF. LV mass was higher, E/A and E/e’ ratios were significantly different, LA volume was significantly higher, TAPSE was lower, and TRV was higher. Most importantly, IAMD correlated well with 6WD (r = 0.72, P = 0.0001).

Discussion.— IAB prevalence among scleroderma patients is high (40%). IAMD was found to be associated with lower exercise capacities, altered LV diastolic function, decreased LA and RV function,
increased pulmonary pressure, and increased natriuretic peptides. This finding suggests that IAB may represent a marker of myocardial involvement and may indicate a poorly compliant left atrium.

**Conclusion.**— IAMD is a simple parameter showing good correlations with all other usual indices of heart involvement. We believe that it should be added to the routine echocardiographic evaluation of scleroderma patients, and that its prognostic value should be evaluated.

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**Athlete’s heart: Echocardiographic modifications at rest and during exercise**

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**Introduction.**— The intense and prolonged exercise training is accompanied by modifications of echocardiography and electrocardiogram.

**Objective.**— Our work has compared the echocardiographic and electrocardiographic parameters of sporting subjects to control subjects in good health whose main difference is the sport.

**Materials and methods.**— We report the results of a prospective study compared 30 athletes and 30 normal subjects, and whose only difference is the sport. This study analyzed the electrocardiogram, transthoracic echocardiography at rest and at peak of exercise. The statistical analysis used the Student test to compare means, and percentages using SPSS. The significance level was set at 5%.

**Results.**— The average age of our patients was 21 years and six months, range: 14 years to 45 years, with a male predominance (78.3%), 47 male and 13 female. Clinically the two series show no statistically significant difference regarding age, weight, height and blood pressure. At the electrocardiogram, athletes have a lower heart rate (45.2 ± 7.0 bpm) vs. (71.3 ± 8.9 bpm) (P = 0.005), a PR interval longer (0.27 ± 0.4 s) vs. (0.12 ± 0.7 s) (P = 0.05), a Sokolow largest (37.4 ± 4.3 mm) vs. (22.6 ± 3.2 mm) (P < 0.0005) and abnormal repolarization mainly represented by negative T waves (P = 0.02), an ST segment elevation in V2 and V3 (P < 0.0005) and a right bundle branch block (P = 0.003). Echocardiography showed dilated right cavities: right atrial (20.3 ± 4.3 cm²) vs. (10.5 ± 3.4 cm²) (P = 0.0125) and right ventricular (26.2 ± 4.1 mm) vs. (21.3 ± 2.3 mm) (P = 0.025). Left ventricular walls are thicker in athletes: septal wall (11.5 ± 3.2 mm) vs. (7.2 ± 2.0 mm) (P = 0.0125) and posterior wall (10.5 ± 2.3 mm) vs. (7.1 ± 2.0 mm) (P = 0.025). Despite a difference in the values of left ventricular diastolic diameter (5 mm on average, between two series), the level of significance was not reached. The left atrium is also dilated (18.2 ± 5.6 cm³) vs. (13.4 ± 4.0 cm³) (P = 0.025). The average myocardial mass indexed to body surface area was 148.3 g/m² in athletes vs. 97.21 g/m² in normal subjects (P = 0.005).

**Conclusion.**— Echocardiographic and electrocardiographic changes are the result of a prolonged and intense sporting activity. Abnormalities of cardiac parameters (echocardiography) concomitant with a moderate physical training should force them to seek an etiology.

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**Aortic root dilatation in young stroke patients with patent foramen ovale**


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**Background.**— No previous study has looked for an association between aortic dilatation and the clinical sequelae of patent foramen ovale (PFO), although a possible relation has been identified in case reports. The aim of this study was to compare aortic dimensions in patients with symptomatic PFO with healthy controls.

**Methods.**— Forty-seven consecutive patients were identified who (a) presented with cerebrovascular accident (CVA) assessed as most likely secondary to PFO (confirmed on bubble study), (b) were under 50 years old, (c) underwent percutaneous PFO closure, and (d) had stored transthoracic echocardiogram images of the aortic annulus and root, as well as age 47 age, sex and BSA-matched healthy controls.

**Results.**— Among the 47 patients, 35 patients (74%) also met the diagnostic criteria for atrial septal aneurysm (ASA). Aortic root diameters were greater in patients with PFO at all three levels. The difference (about 10%) was more marked at the levels of the sinuses of Valsalva (34.4 ± 4.0 mm vs. 30.6 ± 3.4 mm, P < 0.01), and in the proximal ascending aorta (31.8 ± 4.1 mm vs. 28.8 ± 3.1, P < 0.01), and more modest at the level of the aortic annulus (23.1 ± 2.6 mm vs. 22.4 ± 1.8 mm, P = 0.2). Left ventricular measurements showed that PFO patients did not have larger hearts overall (end-systolic diameter: 30 ± 4 mm vs. 32 ± 5 mm, P = 0.10, end-diastolic diameter: 48 ± 5 mm vs. 50 ± 4 mm respectively, P > 0.04).

**Conclusion.**— This study shows that aortic diameter is increased in young PFO patients who have sustained a CVA compared with healthy subjects. This association may be due to a mechanistic effect, or more probably to a common underlying tissue disorder. Our results support further research in this area.

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**Echocardiographic assessment of left atrial function in paroxystic atrial fibrillation**

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**Objectives.**— The conduct of anticoagulation in paroxysmal atrial fibrillation is still disputed based on scores adopted by learned societies. Can we rely on echocardiographic study of atrial function to decide of the anticoagulation? Is the left atrial function retained when the arrhythmia is paroxysmal?

**Patients and methods.**— The prospective study includes 31 patients suffering from heart disease. All patients were undergoing a transthoracic echocardiography. The goal was to compare atrial function in patients with paroxysmal atrial fibrillation history (AF+) and patients with sinus rhythm (FA−).

**Results.**— The average age of patients was 55.24 ± 15 years (range: 12 years, 90 years). Nine patients had a history of paroxysmal AF. The (AF+) group had a significantly dilated left atrium (max Vol: 110.5 ml vs. 48.67 ml, P < 0.0001) and left atrial systolic function is more impaired (left atrial ejection fraction: 27.8% vs. 58.8%, P < 0.003). There was no significant difference between the two groups concerning the ejection fraction of LV systolic (P < 0.12). The peak velocity of systolic wave at mid lateral wall of the left atrium is significantly lower in (AF+) group (11.26 vs. 13.89 cm/s, P = 0.05), while the wave velocity at septal wall was similar in the two groups (P = 0.18). The velocity of the (E) wave (114.61 vs. 80.14, P = 0.02), and the ratio E/Ea (lat) (8.71 ± 5.09, P = 0.01) was significantly higher in patients with history of AF than other patients.

**Conclusion.**— Our results demonstrate the alteration of the atrial function even if the atrial fibrillation is paroxysmal. However, the echocardiographic study of atrial function is not of common practice although it allows in some cases to impose an oral anticoagulant and to prevent.

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**Left ventricular systolic function is not accurately evaluated by left ventricular ejection fraction after a long distance running**

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**Background and objectives.**— Left ventricular (LV) systolic function evaluated by LV ejection fraction (LVEF) is depressed after a long distance running for some studies, not for others. These discrepancies