INTRODUCTION

The literature about Chagas' disease is extensive, presenting several studies in rural and metropolitan areas in an attempt to quantify the social impact of this disease.

The several forms of the disease, divided into acute, indeterminate and chronic, tend to separate it into distinctive clinical entities without a clearly defined interface.

Recent epidemiologic data demonstrate that a series of study sponsored by the WORLD HEALTH ORGANIZATION [1] estimated at 35 million the number of people exposed to the risk of infection, and at 7 million the number of people infected by Trypanosoma cruzi in Latin America, in 1960.

In 1991 the same organization estimated these numbers at 90 and 16 million, respectively [2].

In Brazil, despite the difficulties due to the use of several methodologies, the number of patients infected is estimated at 5-6 million people [3].

This number was already estimated by CHAGAS FILHO in 1968 [4] and PRATA in 1972 [5], therefore, we can infer that the population of infected patients may be effectively greater.

The disease was responsible for severe heart diseases in about 1.3 million Brazilians until the 80’s and nowadays the incidence of the disease is about 3000 cases per year.

Some studies estimate the development of severe heart diseases at about 30% of the infected patients.

On the other hand, 60% of the patients present the indeterminate form of the disease, that is, they are asymptomatic, seropositive and do not present neither electrocardiographic nor radiologic studies abnormalities of the heart or digestive system.

The more detailed studies of Chagas' disease were practically oriented to the chronic phase because of the exteriorization of the symptoms and easily detectable signs in routine examination together with radiologic and electrocardiographic examinations.

To conclude, several longitudinal studies corroborate the excellent prognostic of the indeterminate form of Chagas' disease [6,7,8,9].

The prevalence of this phase decreased with age due to the evolvement of the disease, however, it is important to highlight that after 10 years, almost 80% of the patients are still asymptomatic, likewise, 50% of the infected population will never present clinical manifestations [10].

Therefore, we considered the indeterminate form of Chagas' disease as an entity characterized by serum positivity in the absence of cardiac, digestive or nervous clinical manifestations, as well as absence of electrocardiographic and radiologic abnormalities of the heart and digestive system with no anatomopathologic and functional criteria for its definition [11].

TISSUE DOPPLER

With the advent of echocardiographic technique, a new diagnostic resource was developed in the end of the
80´s.

ISSAZ et al. [12], using conventional instrumentation for pulsed Doppler were able to record the spectrum of velocities of left ventricular walls in a parasternal longitudinal view, correlating them with several phases of the cardiac cycle, and later applying their first observations for a clinical analysis in a large number of pathologies.

Several researchers enhanced and validated the new technology, especially MCDIKEN et al.[13] in Edinburgh and ERBEL et al. [14] in Germany. These authors worked with more sophisticated equipment (high sweeping frequency) enabling greater definition of the structures and enhancing the resolution of Doppler Tissue Imaging (DTI).

The group of MCDIKEN (1992) developed the first color Doppler prototype of the myocardial wall, and was able to quantify accurately the contraction and relaxation velocities of these structures. The group of ERBEL (1995) correlated the movement of the myocardial walls with hemodynamic data and cardiac cycle.

The physical principles that guide DTI are basically the same of those from pulsed Doppler and are dependent on the transmitted and received frequencies, angle of the structures regarding the ultrasonic beam and amplitude of the signs, among others.

The referred system is made to highlight the band that presents greater sign amplitude and low frequency, such as solid heart structures (walls and valves), different from the low amplitude band (around 40dB) and high frequency (red cells).

Thus, higher velocities, such as those from the blood flow (150cm/s) may be easily masked through filters and gain decrease, highlighting the lower velocities given by movement of solid tissues, which rarely exceeds 10-12cm/s.

The color system is then superimposed on the gray-scale image and the color band is ranged on f/8 to f/16 (f - pulse repetition frequency) with a narrower band concentrated in lower values than those obtained from Conventional Doppler Flowmetry (CDF).

Thus, images assessed by DTI may be presented in 3 modalities: two-dimensional color, M-mode color and pulsed Doppler, the last two presenting greater temporal definition.

Pulsed DTI analyses the diastolic left ventricular properties just as CDF inflow (transmitral flow), however, some particularities inherent to both methods must be pointed out: the mitral flow assesses global ventricular filling, whereas DTI is able to estimate regional myocardial relaxation interrogated by the sample volume.

Thus, it is possible to assess each of the 16 segments proposed by the AMERICAN SOCIETY OF ECHOCARDIOGRAPHY [15]. Global left ventricular diastolic function is influenced by a series of factors (pre load, compliance, elastic properties of myocardium fibers and cardiac chambers), whereas regional diastolic performance seems to be a less dependent index of such factors [16,17].

**OBJECTIVE**

To evaluate diastolic function of both ventricles through Conventional Doppler Flowmetry and Doppler Tissue Imaging in patients with the indeterminate form of Chagas’ disease.

**CASUISTIC AND METHODS**

The data for this research was obtained from September 1998 to August 2001, when 52 patients (24 men) with indeterminate form of Chagas’ disease (CH) and mean age of 35.12 ± 5.58 years, from the Ambulatory of the Clinical Division of Infectious Diseases of the Central Institute of Universidade of São Paulo were initially investigated.

As a control group (NL), 45 (12 men) healthy individuals were studied in the same period, employees and students of the Radiology Institute with mean age of 28.64 ± 6.91 years.

All individuals represented a sample of the ethnical difference found in big cities of Brazil, especially in São Paulo.

**INCLUSION CRITERIA**
Asymptomatic patients, seropositive in at least two laboratory tests (indirect immunofluorescent, complement fixation and ELISA), and normal radiologic, electrocardiographic and echocardiographic studies were included in the sample.

EXCLUSION CRITERIA
Patients that presented enlargement of cavitary diameters on M mode echocardiographic examination: left atrium with anteroposterior diameter > 40mm, left ventricular end-diastolic diameter > 56mm, left ventricular systolic diameter > 40mm or patients with evidences of significant valvar dysfunctions by color flow mapping were excluded from the study.

Patients older than 45 years old and patients with systemic hypertension (systolic blood pressure > 140mmHg, and diastolic blood pressure > 90mmHg), obesity (body mass index > 30g/m2), coronary artery disease (typical precordial pain), chronic obstructive pulmonary disease (expiratory dyspnea and radiologic abnormalities compatible with chronic obstructive pulmonary disease), collagenosis (laboratory investigations) and diabetes (fasting glycemia = 126mg/dL) were also excluded from the study.

METHODS
All patients underwent anamnesis, clinical examinations and radiologic studies of the heart and digestive system as well as conventional echocardiography (M mode, two-dimensional and color flow mapping associated with DTI).

Examinations were performed using HDI 3000 Philips Medical System® equipment with 2.5 Mhz sectorial transducer.
Patients were placed in left lateral decubitus, connected to a electrocardiographic derivation with all assessments performed in mild expiratory apneia.

All measurements were performed using echocardiographic technique recommended by the AMERICAN SOCIETY OF ECHOCARDIOGRAPHY.

We considered 3 tomographic planes: long axis, short axis and four chamber apical view.

Left ventricular inflow and outflow was obtained by the apical approach. The sample-volume of pulsed Doppler was positioned as parallel as possible in relation to the flow through the mitral valve and just below the leaflets which enabled the analysis of ventricular filling velocities (E wave/A wave).

After determining maximum velocities the sample-volume was then positioned between the left ventricular inflow and outflow to assess simultaneously the aortic closure and mitral valve opening and this interval is characterized as the global left ventricular isovolumic relaxation time (IVRTg) [18,19,20].

DOPPLER TISSUE IMAGING PERFORMANCE TECHNIQUE
In all individuals DTI was obtained by apical approach - four and two chamber views (the last tilting the transducer 90° in relation to the first). After using color DTI, images were stored in cineloop and transferred to optical disk. The sample-volume was then placed over left ventricular myocardium adjacent to mitral annulus obtaining spectral curves of pulsed DTI in four positions: septal/lateral (four chamber view) and inferior/anterior (two chamber view). (Figs.1 e 2).
Fig. 1. Two-dimensional Color Doppler tissue imaging - apical four chamber view - sample volume positioned on lateral and septal angles of mitral annulus and lateral angle of tricuspid annulus. during systole red color indicates contraction toward the doppler beam; apical region moves in the opposite direction (blue color). RA-right atrium RV-right ventricle LA-left atrium LV-left ventricle.

ivs-interventricular septum - lat-lateral wall
After left ventricular investigation the sample-volume was positioned in tricuspid annulus recording right ventricular lateral wall velocities (Fig.1).

**NORMAL STANDARDS**
Just as the left ventricular inflow assessed by CDF, the DTI demonstrates several waves and intervals that may be studied, with a normal standard established in healthy volunteers [21,22,23].

This is basically formed by a systolic deflection and two diastolic waves with opposite direction to the first one.

The systolic wave represents maximum wall velocity during ventricular ejection (s wave). The first diastolic inscription represents the velocity of wall relaxation during early ventricular filling, just after mitral valve opening (e wave) followed by an interval of relative immobility corresponding to diastasis, and the second diastolic deflection is the expansion of the myocardium caused by atrial systole (a wave). The regional isovolumic relaxation time (IVRTr) may be assessed between the end of s wave and the beginning of e wave (Fig.3).
Fig. 3 - Pulsed doppler tissue imaging of the lateral corner of mitral annulus - Normal - e/a >1 regional isovolumic relaxation time measured from the end of s wave to the beginning of e wave. s-contraction wave e-rapid filling expansion a-atrial systolic relaxation IVRT-lat - regional isovolumic relaxation time

Fig. 4 Pulsed doppler tissue imaging of the lateral corner of mitral annulus - Abnormal relaxation - e/a<1

ANALIZED PARAMETERS
The same parameters were used for the left ventricle anterior wall.

### TABLE 1 – VELOCITIES MEASURES – GLOBAL DIASTOLIC INDEXES

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVRTg</td>
<td>global isovolumetric relaxation</td>
<td>mitral flow – 4 chamber</td>
</tr>
<tr>
<td>E</td>
<td>early filling</td>
<td>mitral flow – 4 chamber</td>
</tr>
<tr>
<td>A</td>
<td>atri systole</td>
<td>mitral flow – 4 chamber</td>
</tr>
<tr>
<td>E/A</td>
<td>velocities ratio</td>
<td></td>
</tr>
</tbody>
</table>

A: abbreviation; B: parameter; C: Conventional Doppler Flowmetry

### TABLE 2 – REGIONAL INDEXES – INTERVENTRICULAR SEPTUM

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-sep</td>
<td>proctodiastolic expansion</td>
<td>Tissue Doppler Imaging – annulus – 4 chamber</td>
</tr>
<tr>
<td>a-sep</td>
<td>telediastolic expansion</td>
<td>Tissue Doppler Imaging – annulus – 4 chamber</td>
</tr>
<tr>
<td>e/a-sep</td>
<td>velocities ratio</td>
<td></td>
</tr>
<tr>
<td>IVRT-sep</td>
<td>isovolumic relaxation time</td>
<td>Tissue Doppler Imaging – annulus – 4 chamber</td>
</tr>
</tbody>
</table>

A: abbreviation; B: parameter; C: method

### TABLE 3 – REGIONAL INDEXES – LEFT VENTRICULAR INFERIOR WALL

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-inf</td>
<td>proctodiastolic expansion</td>
<td>Tissue Doppler Imaging – annulus – 2 chamber</td>
</tr>
<tr>
<td>a-inf</td>
<td>telediastolic expansion</td>
<td>Tissue Doppler Imaging – annulus – 2 chamber</td>
</tr>
<tr>
<td>e/a-inf</td>
<td>velocities ratio</td>
<td></td>
</tr>
<tr>
<td>IVRT-inf</td>
<td>isovolumic relaxation time</td>
<td>Tissue Doppler Imaging – annulus – 2 chamber</td>
</tr>
</tbody>
</table>

A: abbreviation; B: parameter; C: method

### TABLE 4 – REGIONAL INDEXES – RIGHT VENTRICULAR LATERAL WALL

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-rv</td>
<td>proctodiastolic expansion</td>
<td>Tissue Doppler Imaging – annulus – 4 chamber</td>
</tr>
<tr>
<td>o-rv</td>
<td>telediastolic expansion</td>
<td>Tissue Doppler Imaging – annulus – 4 chamber</td>
</tr>
<tr>
<td>e/o-rv</td>
<td>velocities ratio</td>
<td></td>
</tr>
<tr>
<td>IVRT-rv</td>
<td>isovolumic relaxation time</td>
<td>Tissue Doppler Imaging – annulus – 4 chamber</td>
</tr>
<tr>
<td>E/A-rv</td>
<td>velocities ratio</td>
<td>Tricuspid flow – 4 chamber</td>
</tr>
</tbody>
</table>

A: abbreviation; B: parameter; C: method

All assessments were performed by two independent observers with over five years experience in the performance of echocardiographic examinations in university hospitals.

Variations inter and intra-observers were identified through the average of three assessments in ten previous studies for the studied parameters by DTI and for the same observer six days after the first study.

We verified mean differences of 12.6% between the observers and 3.9% for the same observer.

### STATISTIC TREATMENT

For quantitative variables, this analysis was performed through observation of the minimum and maximum values and through the calculation of the mean and standard deviation (SD).

For qualitative variables, the absolute and relative frequencies were calculated.
For the analysis of quantitative variables between the two independent groups, Student's t test was used comparing the mean of two samples when the assumption of normality of data is accepted \cite{24}.

The Brand-Altman's test was used to verify reproductibility of two methods in which the assessment provided continuous variables. Chi-square test or Fisher's exact test was used for comparison between the correlations of diastolic velocities in several regions of the mitral annulus and right ventricle.

All test were performed considering 5% significance level.

Multivariated analysis to obtain the variables most significantly associated with the event - indeterminate form of Chagas' disease - was performed through logistic regression and the parameters that demonstrated \( p < 0.25 \) in univariated analysis were selected and later a stepwise selection process was used \cite{25}.

This enabled us to notice the associations between these variables which is not obtained by univariated analysis.

RESULTS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chagas</td>
<td>Normal</td>
</tr>
<tr>
<td>VVT (ms)</td>
<td>Mean</td>
<td>±</td>
</tr>
<tr>
<td>E (m/s)</td>
<td>0.81</td>
<td>±</td>
</tr>
<tr>
<td>A (m/s)</td>
<td>0.54</td>
<td>±</td>
</tr>
<tr>
<td>E/A</td>
<td>1.59</td>
<td>±</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chagas</td>
<td>Normal</td>
</tr>
<tr>
<td>e - sep (cm/s)</td>
<td>Mean</td>
<td>±</td>
</tr>
<tr>
<td>a - sep (cm/s)</td>
<td>6.85</td>
<td>±</td>
</tr>
<tr>
<td>e/a - sep</td>
<td>1.44</td>
<td>±</td>
</tr>
<tr>
<td>IVRT - sep (ms)</td>
<td>81.24</td>
<td>±</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chagas</td>
<td>Normal</td>
</tr>
<tr>
<td>e - lat (cm/s)</td>
<td>12.08</td>
<td>±</td>
</tr>
<tr>
<td>a - lat (cm/s)</td>
<td>6.03</td>
<td>±</td>
</tr>
<tr>
<td>e/a - lat</td>
<td>2.18</td>
<td>±</td>
</tr>
<tr>
<td>IVRT-lat (ms)</td>
<td>65.87</td>
<td>±</td>
</tr>
</tbody>
</table>
DISCUSSION

In the present study the patients of the CH group may be classified as presenting mild diastolic dysfunction and relaxation abnormalities with normal filling pressures at rest [26].

In the canadian consensus [26], patients with mild diastolic dysfunction were defined as those who presented E/A ratio < 1 and IVRTg > 100ms, demonstrating relaxation disturbance which would be more prolonged with discrete decrease in chamber distensibility, causing decrease in early filling velocity (lower instant gradient between atrium and ventricle) and compensatory increase in the left atrium output.

In our experience, significant differences occurred in IVRTg between two groups with an increase greater than 100ms (mean) in CH group. E/A ratio also presented sensibility to distinguish the two groups, although the mean values of this index were above 1. Of 52 patients from CH group, three (5.8%) presented E/A ratio lower than 1, whereas in the control group, from 45 assessments, only one (2.2%) presented E/A ratio lower than 1. This may be explained by the young age of the population used in both groups. The sample of chagasic patients could also represent an incipient stage of diastolic dysfunction where hemodynamic factors still do not interfere in essentially mechanic phenomena such as the relaxaton index of the cavity which is a mediator factor of IVRTg.

These data did not define the group of chagasic patients alone, although they presented statistic significance for the E/A, E and IVRTg correlation. The small increase in a wave in the CH group, with no significance regarding the NL group, only corroborates the mild diastolic disturbance in this sample.
As microcirculation and its focal distribution may occur in Chagas' disease, we can suppose that DTI is able to identify segments with low compliance as well as their number and distribution in this pathology.

It is known that ischemic abnormalities involve primary subendocardial muscular fibers which are found along the longitudinal axis of the cavity [27]. This was the most adequate ultrasound plane to provide data inherent to this disposition of the myocardium bundle.

Furthermore, the adjacent position to the annulus, therefore, basal, enables better inscription of the deflections and they are more accurately recorded than in the median and apical chamber regions.

Therefore, it can be concluded that indeterminate form of Chagas' disease is an important diagnostic challenge especially referred to early characterization of myocardial involvement.

The usual complementary methods of diagnosis present low sensibility to characterize diastolic dysfunction emphasizing the systolic properties which represents a more advanced stage of the disease. Thus it is possible to infer that diastolic segmental index could lead to early changes in ischemic heart diseases even before the alterations in systolic indexes occur.

In our casuistic, there was prolonged IVRTr, always significant in four angles of the annulus, decrease in protodiastolic velocities, and increase in velocities caused by atrial contraction with significant decrease in early to late filling ratio.

The delay in relaxation is not, however, specific for Chagas' disease or myocardial ischemia, and it may occur in other entities such as hypertrophic and dilated cardiomyopathy, fibrosis and intraventricular conduction disturbances.

The results of our study are in accordance with those observed in ischemic segments, that is, there was a mean prolonging of 34% in IVRT-sep, 44% in the IVRT-inf, 20% in the IVRT-lat and 31% in the IVRT-ant regarding the NL group. However, all regional indexes were clearly shortened regarding the IVRTg assessed by CDF. This finding may be responsible for the origin of inertial forces that create flow even after mechanic relaxation is ended.

In the present study, e/a ratio = 1 was adopted as a criteria of diastolic normality, demonstrated by studies already published [28,29].

DTI was sensible in the detection of postero-inferior wall abnormalities corroborating data already mentioned of greater involvement of this left ventricular segment in chagasic patients, even in the pre-clinical form of the disease.

In our data, 20% of assessments of the e/a variable < 1 in the inferior angle of the mitral annulus occurred. Diastolic involvement of this segment was not observed in any of the patients from group NL. In this segment, the contribution of atrial systole was significantly greater in chagasic patients compared with the other left ventricular walls and also in the right ventricle, demonstrating the low sensibility of this diastolic variable in this group of patients. The direction of flow from the atrial contraction may explain the low sensibility of the a wave of the septal, anterior, and lateral walls, used to differentiate statistically patients from the two groups. In this phase of the cardiac cycle this flow would be performed in the transverse plane with low impact in the longitudinal plane used by us.

DTI was particularly useful in the anterior angle of the mitral annulus because it could demonstrate alterations in the e/a ratio in 13.1% of the performed measures. There were no alterations in this variable in any of patients from normal group.

Our results demonstrated diastolic involvement of the lateral wall in 8% of the patients from group CH.

Although the number of assessments was relatively small we may conclude that DTI was sensible enough to detect early involvement of the diastolic function of the antero-lateral segment since there are few references related to contractile dysfunction in this segment in patients with indeterminate form of the disease.

Using catheterism with left cineventriculography in 40 patients, MARINS et al. [30] reported abnormalities in 21 studies, six of them were described as left ventricular hypokinesis in addition to apical lesions. Also in the hemodynamic study performed by Mady et al. [31] in 23 patients with indeterminate form of the disease, there
are no specific mentions referred to antero-lateral left ventricular cavity involvement. MARIN-NETO et al. [32], using radioisotopic angiography investigated early involvement of both ventricles in patients with the indeterminate and digestive form of the disease. They reported in the first group nine (7%) hypokinetic of 128 segments assessed in left ventricle, three were apical, two were septal, two were postero-lateral and two were infero-posterior.

Finally, it is worth mentioning that in autopsies performed in 118 patients with the chronic form of the disease more intense abnormalities of the lateral wall were observed in 12% of the cases and alterations of the anterior wall was observed in only 6% of the cases [33].

In our casuistic, the association of assessments involving the antero-lateral angle revealed in group CH 10.4% of diastolic abnormalities and only 1.35% in the control group.

We must highlight, however, that in the plane correspondent to basal portions, almost ¼ of all assessments were abnormal in the diastolic phase, taking the e/a quantitative variable into account.

The importance of the findings involving the right ventricle confirms data mentioned in other studies demonstrating the participation of this chamber in the polymorphic picture of Chagas' disease.

Right ventricular biopsies in a study of Mady et al. [34] of patients with the indeterminate form of the disease demonstrated that around 40% of the cases did not show alterations by optical microscopy using the hematoxylin-eosin and Masson's trichrome stain techniques, whereas around 60% presented fibers degeneration, interstitial edema, inflammatory infiltration and fibrosis.

In the hemodynamic study of the indeterminate form of the disease, statistically significant differences occurred in initial and final right ventricular diastolic pressures. No abnormalities were observed on the systolic pressure of chagasic patients in relation to normal individuals (31).

MARIN-NETO et al. [35] studying 11 patients with the indeterminate form of the disease and eight patients with the chronic form, verified severe right ventricular involvement in both groups. In the quantitative analysis, the authors observed dyskinesia of the apical region and right ventricular free wall in all the patients with the indeterminate form and they concluded that severe right ventricular involvement is undoubtedly the most significant data observed in asymptomatic chagasic patients with no other signs of heart disease.

In our data, of the 22 patients that could be assessed for right ventricular systolic and diastolic parameters, 12 (54.5%) presented lateral wall abnormalities (e/a -rv <1). These findings although cannot be compared are in accordance with the histopathologic studies [34]. Of these 12 patients, 9 (75%) did not present concurrent changes in any of the four regions of the mitral annulus confirming data already described in other studies about the independent feature of right ventricular involvement in relation to left ventricle, especially in the early phases of Chagas' disease.

It is interesting to notice that with sample volume positioned in a single site (lateral angle of the right ventricular free wall) only alterations provided by DTI could occasionally indicate an incipient deterioration of this chamber once the pattern of tricuspid flow were normal in all the assessments performed by CDF.

In conclusion, it is important to highlight the good correlation of regional and global left ventricular diastolic indexes which may indicate a certain level of proportionality between the mechanic relaxation and ventricular filling, at least in this phase of the disease, when there are less segments involved. Our results agree with those from Rodriguez et al. [36] who, studying 23 individuals with neither clinical nor echocardiographic evidences of heart disease and 17 patients with LV concentric hypertrophy, observed linear correlation between E/A and e/a -lat in the first group; E/A values were considerably greater than e/a -lat in patients with hypertrophy which may be explained by increase in left atrial pressure and apparent normalization of the mitral flow.

The anatomy of left ventricular cavity creating contraction and expansion forces almost parallel to the inflow and outflow tracts favored this kind of pattern changing only with marked distortions of this chamber. Perhaps with the progression of the chagasic process involving a greater number of segments, especially with the exploration of medium-apical regions using a greater number of planes, this linearity disappears.

In right ventricle inverse correlation of these indexes occurred, pointed out its early involvement by interrogation of the only site technically suitable for recording DTI curves.

In this chamber, the exploration of other segments is not similar to left ventricle because many of them are
perpendicular to the Doppler beam, just as the right ventricular outflow tract. The anatomical factor increases the importance of assessment of the IVRT-rv because for assessments of the global IVRT of the right side there would be greater time spend for the records of closure of pulmonary valve and tricuspid opening, requiring two orthogonal planes, different from the left side where the assessment is performed in the same heart beat.

To conclude with, our experience with this relatively new methodology reinforces fundamented knowledge of more frequent involvement of right ventricular cavity in asymptomatic patients or even in those patients with abnormal electrocardiograms without cardiomegaly.

In the logistic regression model the conjunction of three variables (age - ejection fraction - e-rv) demonstrated 81.1% sensibility, 88.9% specificity and 86.6% accuracy. When e-rv was replaced by DPp% (percentage of left ventricular posterior wall thickening) these indexes were 75%, 74.4% and 74.7%, respectively. This fact highlights the importance that a diastolic variable may have, which would be the expression of a ventricular distensibility more vulnerable to hemodynamic changes.

It may be possible with DTI to estratify patients with the indeterminate form of the disease who tend to present global heart failure due to left ventricular involvement which may be changed through medication in its deleterious course.

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Country: Argentina

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