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Disagreement between tissue Doppler imaging and conventional pulsed wave Doppler in the measurement of myocardial performance index

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Abstract *Aim:* Myocardial performance index (MPI) is usually measured with pulsed wave Doppler (PWD). Our aim was to assess the degree of agreement between PWD and a method based on tissue Doppler imaging (TDI).
Methods and results: Seventy-five patients with prior myocardial infarction and 20 healthy subjects underwent measurement of time intervals and MPI with PWD and pulsed TDI at septal and lateral sides of mitral annulus. MPI and TDI-MPI at septal side showed the best intraclass correlation coefficient (ICC = 0.54; $p < 0.0005$). Ninety-five percent interval of agreement ranged from −0.27 to 0.22. These differences were attributed to discrepancies in isovolumic contraction and relaxation times. In the healthy group the results were similar (ICC = 0.44), although the 95% interval of agreement was lower (from −0.13 to 0.12).
Conclusions: The agreement between PWD and TDI in the measurement of MPI is only moderate. This should be taken into account in the interpretation of studies in which TDI is used for this measurement.

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Introduction

Myocardial performance index (MPI), defined as the sum of isovolumic contraction and relaxation times divided by ejection time, is a powerful index which provides evaluation of systolic and diastolic functions at the same time.[1,2] Its prognostic value in patients with diverse heart diseases such as myocardial infarction has been proved in several studies.[3–15] The classical approach to measure MPI is pulsed wave Doppler.[2] Recently some investigators have measured MPI with tissue Doppler imaging (TDI) in substitution of the classical approach. Our aim was to establish the degree of agreement between classical and TDI methods in patients with a recent myocardial infarction.

Methods

Seventy-seven patients featuring a prior myocardial infarction (MI) less than a year before were included in this study and underwent a complete Doppler-echocardiographic study. Time intervals were measured in 75 of them (97.4%), as 2 patients were excluded because they did not have a sinusal cardiac rhythm (one of them showed atrial fibrillation, the other showed pacemaker rhythm). Thirty-seven of these patients underwent a second echocardiographic study (12.2 $\pm$ 18.7 days after the previous one) to assess test–retest variability of the indexes. A second group of 20 healthy young people also underwent a similar study in order to evaluate the relationship between classical Doppler and TDI intervals in the absence of myocardial disease.

Echocardiography

Fig. 1 shows the Doppler images recorded for the measurement of time intervals necessary to calculate MPI with conventional and TDI methods.

Conventional Doppler

All the studies were performed with a Sonos 4500 equipment (Andover, USA) with a 2.5-mHz transducer. Pulsed Doppler study of transmitral inflow was made placing the sample between the tips of the mitral leaflets in the four chambers' view and ''*a*'' interval was measured between cessation and onset of the mitral inflow. Pulsed Doppler study of left ventricular (LV) outflow was made placing the sample just below the aortic valve in the five chambers and ''*b*'' interval was measured between onset and cessation of the LV outflow.

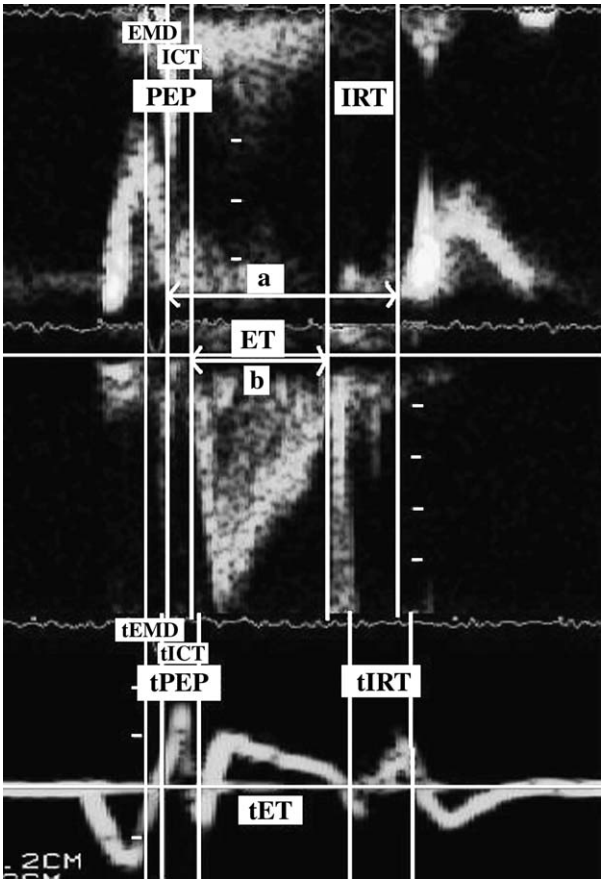

Figure 1 Time intervals measured from pulsed Doppler transmitral inflow and left ventricular outflow (PEP = preejection period, which includes EMD = electromechanical delay and ICT = isovolumic contraction time; ET = ejection time; IRT = isovolumic relaxation time) and their equivalent intervals measured from pulsed tissue Doppler (tPEP = tissue preejection period; tEMD = tissue electromechanical delay; tICT = tissue isovolumic contraction time; tET = tissue ejection time; tIRT = tissue isovolumic contraction time). MPI is calculated as $(a - b)/b$ which is equal to (ICT + IRT)/ET; tMPI is calculated as (tICT + tIRT)/tET.

Intervals ''*a*'' and ''*b*'' were obtained from the average of three consecutive cardiac cycles. Conventional MPI was obtained as $(a - b)/b$.

Other intervals were also measured from the same recordings: preejection period (PEP) was defined as the interval from the onset of Q wave of ECG to the onset of LV outflow; electromechanical delay (EMD) from Q wave to cessation of mitral inflow; isovolumic contraction time (ICT) was calculated as (PEP – EMD); isovolumic relaxation time (IRT) was obtained as $(a - b -$ ICT). Finally, filling time (FT) was calculated as RR $- a$, where RR is the interval in milliseconds, deduced from heart rate. All measurements were performed off-line on digital recordings.

TDI

Pulsed wave TDI was performed at septal mitral annulus and lateral mitral annulus. Three consecutive cycles were recorded in order to obtain the mean values. TDI isovolumic contraction time (tICT) was measured between cessation of A′ wave and onset of S wave; TDI ejection time (tET) was obtained between onset and cessation of S wave; TDI isovolumic relaxation time (tIRT) was obtained between cessation of S wave and onset of E′ wave. tMPI was calculated as (tICT + tIRT)/(tET). Three types of tMPI were defined: tMPI at septal annulus (tMPIs), at lateral annulus (tMPIl) and the mean value of both (tMPIm).

Statistics

Intraclass correlation coefficient (with absolute agreement definition) (ICC) was used to assess the degree of agreement between conventional and TDI methods. ICC < 0.40 was considered mild agreement; 0.41—0.75 moderate; 0.76—1 good agreement.[14,15] Bland and Altman plots were used to show the intervals of agreement between the methods, in order to evaluate the clinical relevance of the differences.[16] Pearson's correlation coefficient was used to assess linear correlation between the new indexes and other clinical and echocardiographic variables. A paired *t*-test was used to evaluate the differences between several time intervals measured by the different methods. A *p* value below 0.05 was considered statistically significant.

Variability was defined as the difference between the measurements divided by the mean value of both and is expressed as percentage. Interobserver and intraobserver variabilities were calculated with 2 measurements from the same recordings (measured by two observers for interobserver variability, and measured by the same observer for intraobserver variability). Test—retest variability (reproducibility) was calculated with measurements from two different studies of the same patients (measured by the same observer).

Results

Patients with prior MI

The characteristics of this group of patients are displayed in Table 1. Doppler measurements with conventional and new TDI methods are shown in Table 2. The global differences between MPI and tMPI were not significant ($p = 0.057$ for MPI and tMPIs; $p = 0.16$ for MPI and tMPIl). Of the two regions of interest explored with TDI, the most reliable index was tMPI measured at septal mitral annulus (tMPIs). ICC for tMPIs (95% confidence interval ICC = 0.36—0.69) suggested a significant but only mild to moderate degree of agreement between tMPI and conventional MPI. ICC was lower for tMPIl (95% CI ICC = 0.09—0.49) and tMPIm (0.28—0.63). Fig. 2 shows Bland and Altman plot of the differences between both the methods in relation to the average value. There was a clinically important disagreement in many of the MPI estimations (95% limits of agreement from −0.22 to

Table 1 Patients — data

Categorical variables	*Number (%)*
Sex (male/female (nr, % male))	57/18 (76%)
Diabetes mellitus	13 (17.3%)
Hypertension	37 (49.3%)
Hypercholesterolemia	42 (56%)
Smoker	23 (30.7%)
ST elevation AMI	39 (52%)
ECG localization:	
- Inferior	25 (33.3%)
- Anterior	21 (28%)
- Lateral	2 (2.7%)
- Unknown	27 (36%)
Continuous variables	*Mean ± SD*
Age (years)	64.7 ± 11.2
Heart rate (bpm)	69.3 ± 11.3
Systolic pressure (mm)	133.2 ± 20.4
Diastolic pressure (mm)	83.0 ± 13.4
Ejection fraction (%)	59.7 ± 13.5
Wall motion score index	1.4 ± 0.4
Left atrial size (mm)	41.3 ± 5.4
Left ventricle diastolic diameter (mm)	45.6 ± 7.3
Left ventricle systolic diameter (mm)	29.2 ± 7.8
Interventricular septum diastolic diameter (mm)	12.9 ± 2.6
Posterior wall diastolic diameter (mm)	9.6 ± 2.2
E wave peak velocity (cm/s)	76.7 ± 22.4
A wave peak velocity (cm/s)	89.4 ± 31.7
E wave deceleration time (ms)	221.1 ± 63.5
S wave (TDI septal annulus) (cm/s)	8 ± 8.3
E′ wave (TDI septal annulus) (cm/s)	6.5 ± 6.8
A′ wave (TDI septal annulus) (cm/s)	9.3 ± 3.1
S wave (TDI lateral annulus) (cm/s)	8.1 ± 2.3
E′ wave (TDI lateral annulus) (cm/s)	7.9 ± 3.4
A′ wave (TDI lateral annulus) (cm/s)	10.6 ± 2.9

Characteristics of 75 patients with prior MI included in the study including demographic data, classification of prior AMI and some clinical and 2D-echo data.

Table 2 Patients — time intervals and indexes

PWD	Mean ± SD	TDIs	Mean ± SD	*p*	ICC	*p*	TDIl	Mean ± SD	*p*	ICC	*p*
''*a*'' (AE)	438.9 ± 41	tAEs	453.8 ± 41.1	ϕ	0.70	ϕ	tAEl	454.4 ± 43.6	ϕ	0.62	ϕ
''*b*'' (ET)	300.6 ± 28.1	tETs	316.8 ± 28.7	ϕ	0.72	ϕ	tETl	316.8 ± 31.4	ϕ	0.60	ϕ
PEP	94.5 ± 17.3	tPEPs	114.2 ± 19.3	ϕ	0.14	*	tPEPl	122.2 ± 25.8	ϕ	0.12	*
EMD	50.1 ± 20.5	tEMDs	55.5 ± 24.1	NS	0.37	ϕ	tEMDl	54.8 ± 27.7	NS	0.23	*
ICT	44.4 ± 22.4	tICTs	58 ± 22.1	ϕ	0.33	ϕ	tICTl	66.8 ± 21.4	ϕ	0.21	*
IRT	94.1 ± 26.9	tIRTs	79 ± 25.9	ϕ	0.36	ϕ	tIRTl	70.7 ± 26.9	ϕ	0.12	NS
FT	500.1 ± 144.2	tFTs	485.2 ± 142.6	ϕ	0.97	ϕ	tFTl	484.6 ± 146.1	ϕ	0.97	ϕ
MPI	0.47 ± 0.13	tMPIs	0.44 ± 0.13	NS	0.54	ϕ	tMPIl	0.44 ± 0.13	NS	0.30	ϕ
PEP/ET	0.32 ± 0.07	tPEP/ETs	0.37 ± 0.08	ϕ	0.17	*	tPEP/ETl	0.39 ± 0.09	ϕ	0.13	NS

$*p$ Value < 0.05; ϕ p value < 0.01.
Time intervals measured by transmitral pulsed wave Doppler (PWD) and their equivalent tissue Doppler imaging intervals at septal annulus (TDIs) and at lateral annulus (TDIl) for the MI group. The column entitled ''Mean ± SD'' contains the mean values, standard deviations and p values for paired t-tests between PWD measurements and TDI ones, for assessing the global differences between the methods. The column entitled ''ICC'' contains the values of intraclass correlation coefficients, which indicate degree of agreement between the methods. The definitions of abbreviations used for time intervals are explained in the text. An initial ''*t*'' indicates that the interval is measured from TDI. The letter at the end (''s'' or ''l'') indicates septal or lateral side of mitral annulus.

0.27). Twenty patients (26.7%) showed a difference between methods higher than 0.1. Further details about Bland and Altman analysis of these patients are shown in Fig. 3 and Table 3. When analyzing only patients without defects of contractility in basal segments ($n = 29$), the results were similar (Bland and Altman 95% interval of agreement from −0.27 to 0.22; ICC = 0.35; $p = 0.03$).

The analysis of the mean differences of time intervals showed that there were significant differences in the measurement of all of them (PEP, ICT, ET, IRT, FT) between the two methods (conventional and TDI), with the exception of EMD (NS). Of the intervals needed to define MPI, ejection time (ET) estimations showed the best intraclass correlation (ICC=0.7188; $p < 0.0005$). ICT and IRT only showed mild agreement between the methods.

There were no significant linear correlations between any of MPI measurement methods and heart rate or systolic/diastolic arterial pressure values. Mild correlations of MPI and tMPI with left ventricular ejection fraction (LVEF) and wall motion score index (WMSI) are displayed in Table 4.

Inter and intraobserver variabilities

Interobserver variability was 7.6% ± 4.3% for MPI; 18.8% ± 21.5% for tMPIs; 21.5% ± 21.4% for tMPIl. Intraobserver variability was 8.3% ± 4% for MPI; 7.8% ± 11% for tMPIs; 9.3% ± 10.1% for tMPIl.

Test—retest variability

In the subgroup undergoing a second study for test—retest comparisons ($n = 37$) there were no significant differences between both the studies in heart rate (66.38 ± 11.18 vs. 67.43 ± 12.57) or diastolic blood pressure (83.06 ± 13.02 vs. 82.26 ± 14.31). There was a statistically non-significant trend to higher systolic blood pressure values in the second study (130 ± 16.43 vs. 138.71 ± 28.84; $p = 0.06$). Mean MPI values were similar in both studies (0.46 ± 0.11 vs. 0.45 ± 0.11) but there were significant differences in tMPIs (0.43 ± 0.14 vs. 0.47 ± 0.13; $p = 0.04$) and tMPIl (0.41 ± 0.13 vs. 0.46 ± 0.13).

The values of test—retest variability in these patients were 16.9% ± 16.9% for MPI; 22.1% ± 19.4% for tMPIs; 18.6% ± 20% for tMPIl.

Healthy control group

Time intervals and indexes measured with conventional method and TDI methods in this group are shown in Table 5.The values of MPI ranged from 0.27 to 0.46. Both tMPIs and tMPIl showed a mild to moderate intraclass correlation with MPI (95% CI = 0.00—0.73 for ICC between MPI and tMPIs; 0.09—0.76 for ICC between MPI and tMPIl; 0.24—0.82 for ICC between MPI and tMPIm). Fig. 4 shows Bland and Altman plots showing the 95% agreement interval. More details are displayed in Table 6.

Discussion

Although most studies refer to TDI's focus on the measurement of velocities, some investigators have used TDI to obtain systolic and diastolic time

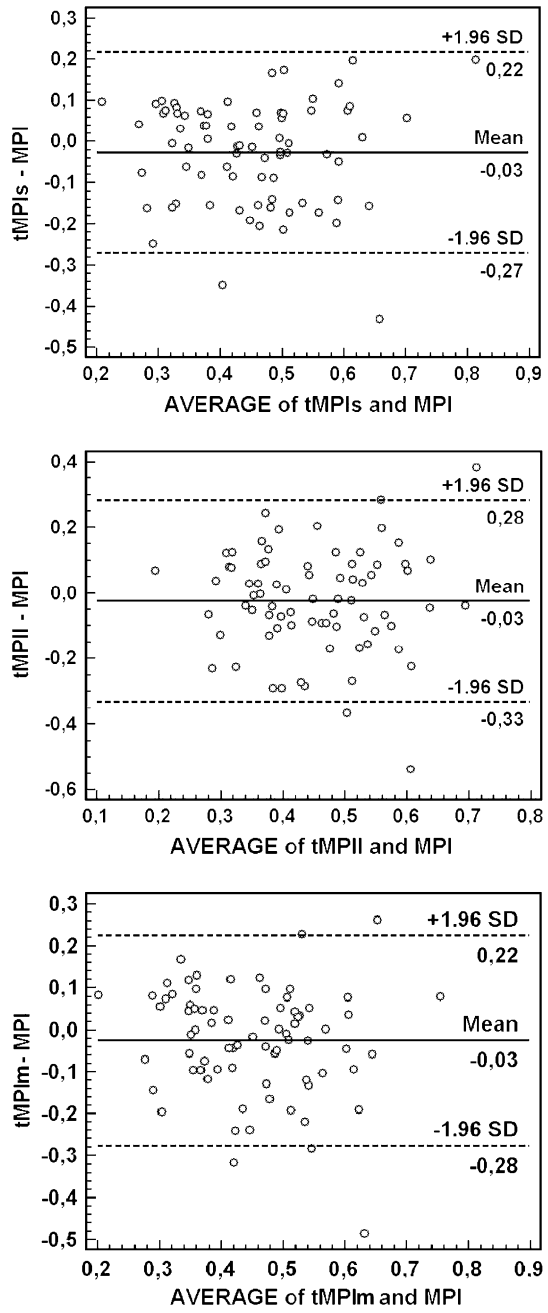

Figure 2 Bland and Altman plots of MPI and tMPI at septal annulus (tMPIs), lateral annulus (tMPIl) and the mean values of both (tMPIm) for the MI group. The differences between the methods are displayed against the average of both measures. The lines represent mean difference and 95% interval of agreement in absolute value of the differences.

intervals.[17] These can be measured from pulsed wave TDI or color M-Mode TDI recordings. Pulsed wave TDI has the advantage of a high temporal resolution, and it only requires good visualization of the region of interest selected, usually mitral annulus. Conventional measurement of MPI usually requires the recording of transmitral flow and left ventricular outflow separately and therefore its calculation is relatively complex because of the need to obtain an average measure of several cardiac cycles, in order to avoid the influence of heart rate variations. The measurement of time intervals from pulsed wave TDI could provide an easier way to calculate MPI and other parameters within a single cardiac cycle. There has been few attempts to validate TDI as a method for measuring MPI.[18–22] According to these studies the agreement between the methods is high in healthy subjects and dilated cardiomyopathy, and slightly lower in patients with previous myocardial infarction (MI). The main limitation of these studies is the very low number of patients included. Our study shows that MPI measured with mitral annulus tissue velocity intervals has only a mild to moderate agreement with traditional MPI.

In patients with prior myocardial infarction, TDI intervals may be influenced by intraventricular conduction disturbs, asynchrony, and the differences in the contraction and relaxation times between the different myocardial segments. Mitral annulus velocity intervals, in particular, could be highly influenced by the contractility of basal segments. However, the differences between conventional MPI and tMPI were similar in patients with good contractility of basal segments and even in patients without segmentary contractility alterations. Furthermore, similar observations can be found in healthy subjects. Therefore the disagreement between methods does not seem to depend on contractility alterations. We observed that the values of ICT and ET intervals measured with TDI were larger than the ones obtained with conventional Doppler; this could increase tMPI values. On the other hand, IRT interval was usually shorter with TDI, and this could decrease tMPI values. The results of both the influences are values of MPI and tMPI of similar range, but not accurate ones. Of the intervals needed to calculate tMPI, ET showed lower differences with the conventional method, while tICT and tIRT correlated poorly with classic intervals. Therefore, isovolumic times are in most part the responsible components of MPI which explain the differences between conventional MPI and tMPI.

Considering these results, tMPI should be defined as a different index, and not as an alternative way to obtain classic MPI, because tMPI is obtained from tissue velocity time intervals that are not exactly coincident with flow time intervals. This does not mean that tMPI is not useful, but the different cutoff values must be defined, and specific studies must be done to know its

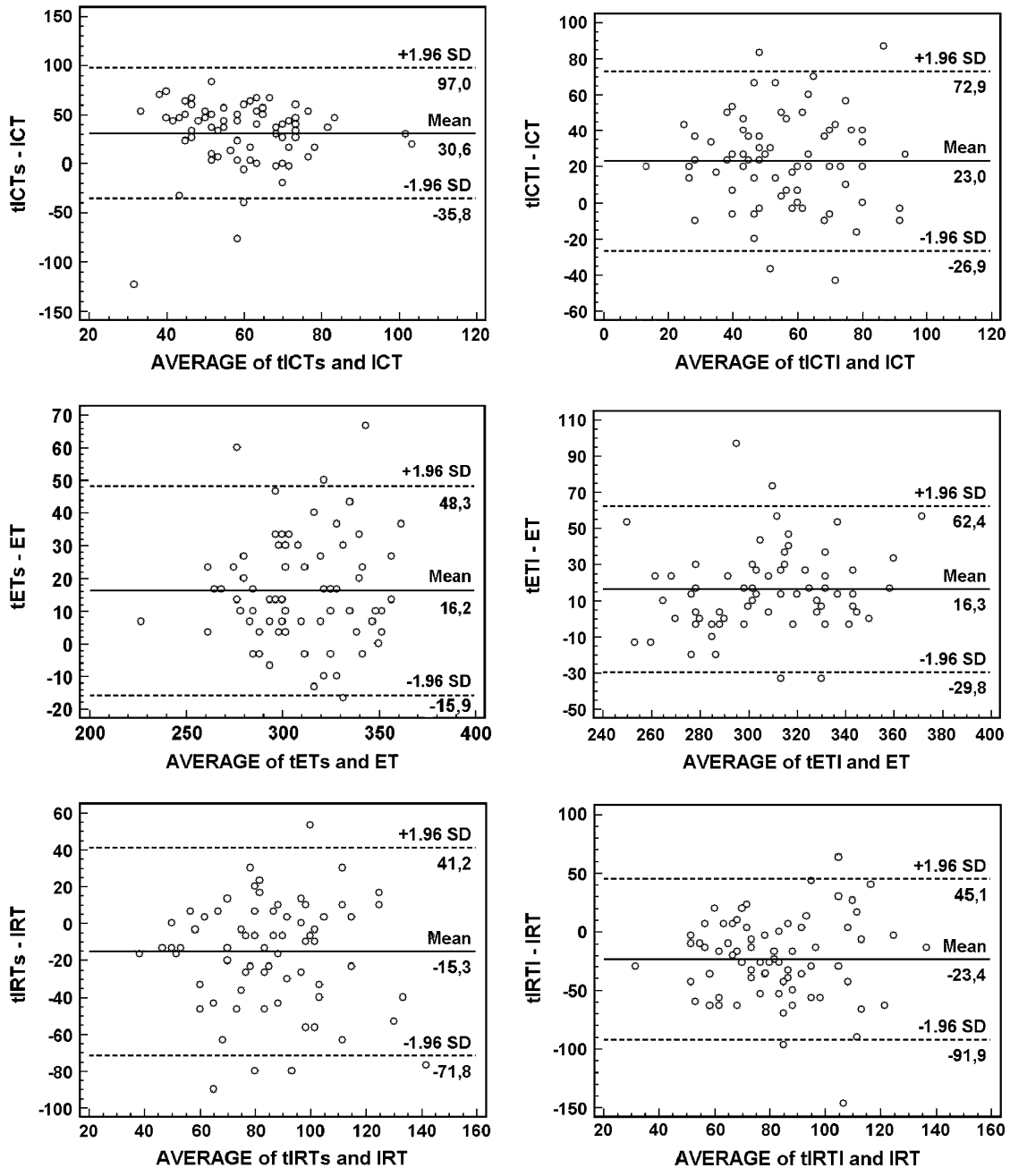

Figure 3 Bland and Altman plots for the components of MPI in the MI group: isovolumic contraction time (ICT), ejection time (ET) and isovolumic relaxation time (IRT). On the left, comparisons between the conventional Doppler method and TDI method at septal annulus. On the right, the same comparisons for lateral annulus.

features. The best agreement is reached when measuring at septal annulus. This can be partially explained by the worst image definition provided by lateral annulus, and also by the asynchrony between both the locations of mitral annulus. However, in healthy people lateral annulus seemed to be equal or slightly better than septal annulus. The use of mean values of septal and lateral tMPI did not improve the agreement. The analysis of time intervals suggests that systolic velocity time intervals measured with TDI last more time than their correspondent systolic flow intervals (measured with conventional Doppler). These include PEP (divided in subintervals EMD and ICT) and ET. tPEP and its subintervals last more time than conventional ones, and so ejection velocities are delayed. tET is also slightly longer than conventional one, and therefore isovolumic

Table 3 Patients — Bland and Altman analysis

	MD (%)	95% IOA (abs. dif.)	95% IOA (% av.)
ICT and tICTs	30.6 (34%)	−35.8 to 97	−68.2% to 136.2%
ICT and tICTl	23 (47.5%)	−26.9 to 72.9	−54.9% to 149.9%
ET and tETs	16.2 (5.3%)	−15.9 to 48.3	−5% to 15.5%
ET and tETl	16.3 (5.2%)	−29.8 to 62.4	−9.9% to 20.3%
IRT and tIRTs	−15.3 (−19%)	−71.8 to 41.2	−86.9% to 48.9%
IRT and tIRTl	−23.4 (−30.5%)	−91.8 to 45.1	−112.5% to 51.5%
MPI and tMPIs	−0.03 (−6%)	−0.27 to 0.22	−61.9% to 49.8%
MPI and tMPIl	−0.03 (−5.7%)	−0.33 to 0.28	−73.3% to 61.9%

Bland and Altman analysis of the components of MPI in the MI group. The mean difference between the methods and the 95% intervals of agreement are expressed in absolute value and as percentage of the average.
MD = mean difference; 95% IOA (abs. dif) = 95% interval of agreement (absolute differences); 95% IOA (% av.) = 95% interval of agreement (percentage of the average).

relaxation velocities are very delayed when compared with conventional IRT. On the other side, diastolic velocity intervals seem to be shorter than diastolic flow intervals, especially IRT, and also FT in a minor way. Of these observations we can deduce that left ventricular contraction does not end before aortic valve is closed, moreover it seems to persists a little time after that and therefore relaxation velocities are delayed and shortened when compared with IRT and filling time measured by conventional Doppler. This delay is increased in the presence of myocardial ischemia, as it has been proved by García-Fernández et al.[23] and Rivas-Gotz et al.[24] but it does exist in patients without regional contractility alterations, and even in healthy people.

With regard to variability data, we found that variability of measuring conventional MPI from the

Table 4 Correlations

Type of MPI	Corr. with LVEF	Corr. with WMSI
Conventional MPI	$r = -0.306$ ($p = 0.008$)	$r = 0.271$ ($p = 0.018$)
tMPIs	$r = -0.350$ ($p = 0.002$)	$r = 0.300$ ($p = 0.009$)
tMPIl	$r = -0.216$ (NS)	$r = 0.158$ (NS)
Mean tMPI	$r = -0.319$ ($p = 0.005$)	$r = 0.258$ ($p = 0.025$)

Correlations (Corr.) of MPI with left ventricular ejection fraction (LVEF) and wall motion score index (WMSI), for the different methods of measuring MPI in patients with prior myocardial infarction.

Table 5 Healthy group — time intervals and indexes

PWD	Mean ± SD	TDIs	Mean ± SD	*p*	ICC	*p*	TDIl	Mean ± SD	*p*	ICC	*p*
''*a*'' (AE)	392.5 ± 30.3	tAEs	412.7 ± 26.8	ϕ	0.00	NS	tAEl	416 ± 33.4	ϕ	0.00	NS
''*b*'' (ET)	291.2 ± 20.5	tETs	307.3 ± 19.4	ϕ	0.64	ϕ	tETl	312.2 ± 21.6	ϕ	0.48	ϕ
PEP	88 ± 11.5	tPEPs	102.3 ± 13.1	ϕ	0.39	ϕ	tPEPl	94.7 ± 19.7		0.31	NS
EMD	40.5 ± 15	tEMDs	49.3 ± 23.5		0.48	ϕ	tEMDl	37.5 ± 22.4		0.65	ϕ
ICT	47.5 ± 13.5	tICTs	53 ± 16.7		0.17	NS	tICTl	57.2 ± 19.4		−0.01	NS
IRT	53.8 ± 15.9	tIRTs	52.3 ± 12.5		0.11	NS	tIRTl	46.7 ± 14.9		0.04	NS
FT	513.1 ± 137	tFTs	494.9 ± 143.2	ϕ	0.98	ϕ	tFTl	489.6 ± 143	ϕ	0.98	ϕ
MPI	0.35 ± 0.06	tMPIs	0.35 ± 0.06		0.44	*	tMPIl	0.33 ± 0.08		0.50	*
PEP/ET	0.30 ± 0.04	tPEP/ETs	0.33 ± 0.05	ϕ	0.51	*	tPEP/ETl	0.30 ± 0.07		0.21	NS

* p Value < 0.05; ϕ p value < 0.01.
Values of time intervals and intraclass correlation for the healthy group. Abbreviations as in Table 2.

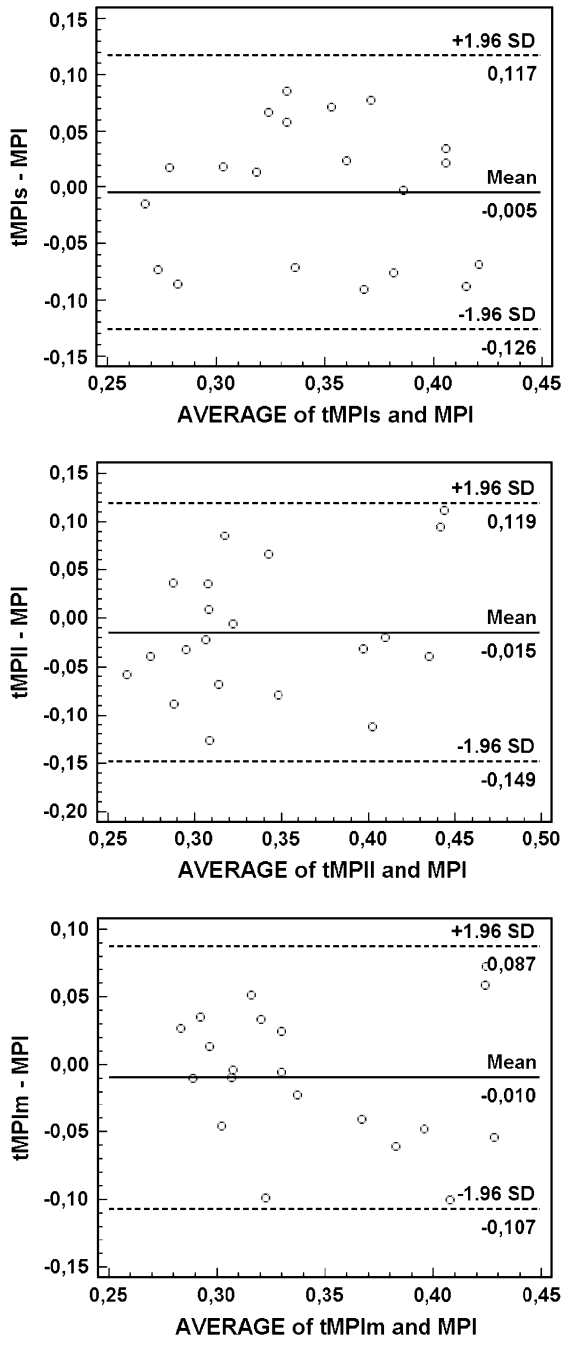

Figure 4 Bland and Altman plots of MPI and tMPI at septal annulus (tMPIs), lateral annulus (tMPIl) and mean values of both (tMPIm) for the healthy group ($n = 20$).

same recordings was little and it did not depend on the observer. On the other hand, intraobserver variability of tMPI was also little but interobserver variability was much bigger. This may be explained because the limits of the different intervals from DTI are often poorly defined and they require a specifically trained observer. Therefore conventional MPI has also the advantage of being easily measured by an average echocardiographist.

Test–retest data show that MPI and tMPI are not accurately reproducible when they are measured two times on different days, specially in the case of tMPI which actually showed significantly higher values in the second study. This may be due to different load conditions and to the higher systolic blood pressure values observed at the second time. Therefore neither MPI nor tMPI seem to be accurate indexes to perform serial studies of the same patients, and particularly tMPI seems to be too sensitive to the mild hemodynamic shifts usually observed in this context.

Knowing that MPI and tMPI showed only a moderate degree of agreement in ischemic patients, data from healthy subjects confirmed that disagreement also in healthy people. In Bland and Altman analysis the differences observed were lower when compared with the study in patients with prior myocardial infarction. This is partially explained by the shorter values and lower range of values observed in healthy people, resulting in lower differences. However, Tables 3 and 6 display the agreement intervals as percentage (which is less influenced by the range of values) showing that the differences observed in healthy people are proportionally lower than the ones observed in ischemic patients. Therefore, the disagreement between methods does not depend entirely on the alterations induced by ischemic disease on left ventricle, but the range of the differences is clinically more important in patients with ischemic disease. In healthy individuals TDI at lateral annulus showed a higher mean ICC with conventional method than TDI at septal annulus did, but this does not seem to be relevant, as the 95% confidence intervals of ICC were wide and similar for both locations.

Conclusion

MPI can be easily measured with TDI at mitral annulus, specially at septal side. However, the agreement between TDI and conventional method is not good, because systolic intervals are longer and diastolic intervals are shorter when measured with TDI. The disagreement exists on healthy people and it is increased on patients with prior myocardial infarction. This should be taken into account when interpretating studies in which TDI is used to measure this index. Further studies are needed to assess if tMPI has any independent value in the evaluation and prognosis of heart failure.

Table 6 Healthy group — Bland and Altman analysis

	MD (%)	95% IOA (abs. dif.)	95% IOA (% av.)
ICT and tICTs	5.5 (10.5%)	−32.7 to 43.7	−68.1% to 89.2%
ICT and tICTl	9.7 (17.2%)	−37 to 56.3	−70% to 104.3%
ET and tETs	16.2 (5.4%)	−5.4 to 37.7	−1.8% to 12.6%
ET and tETl	21 (7%)	−10.1 to 52.1	−3.2% to 17.2%
IRT and tIRTs	−1.5 (−1.2%)	−38.9 to 35.9	−73.6% to 71.1%
IRT and tIRTl	−7.2 (−13.7%)	−48.9 to 34.5	−94.8% to 67.3%
MPI and tMPIs	−0.005 (−1.4%)	−0.126 to 0.127	−37% to 34.1%
MPI and tMPIl	−0.015 (−5.4%)	−0.149 to 0.119	−44% to 33.2%

Bland and Altman analysis of healthy group. Abbreviations as in Table 3.

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