Association between P-wave and diastolic function

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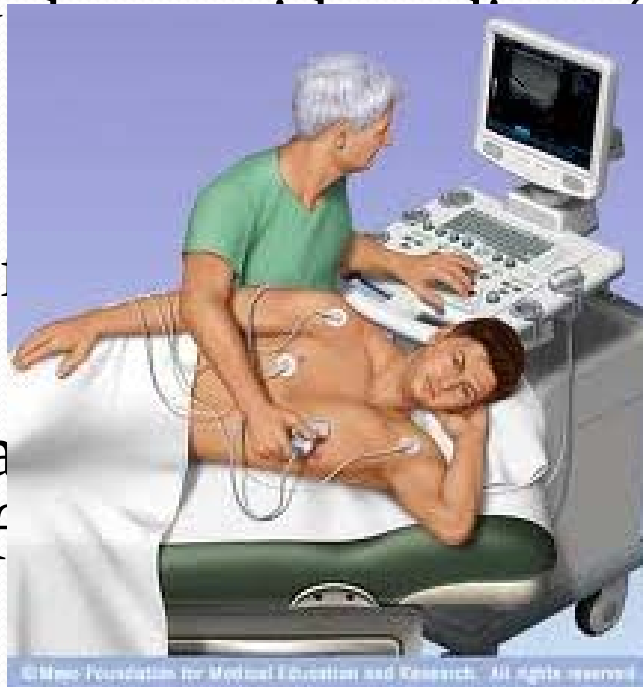# Background and Rationale

Heart failure (HF)

↓

Common problems in cardiovascular medicine

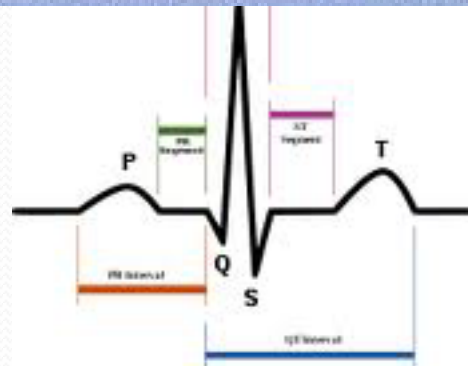diastolic dysfunction with preserved EF (HF-PEF) were presented in 44%.

Bursi F, et al. Systolic and diastolic heart failure in the community. *JAMA*. 2006;296:2209 –2216.

Background and Rationale

The ECG may diastolic function.

The purpose o
        - to find   s easy, cost
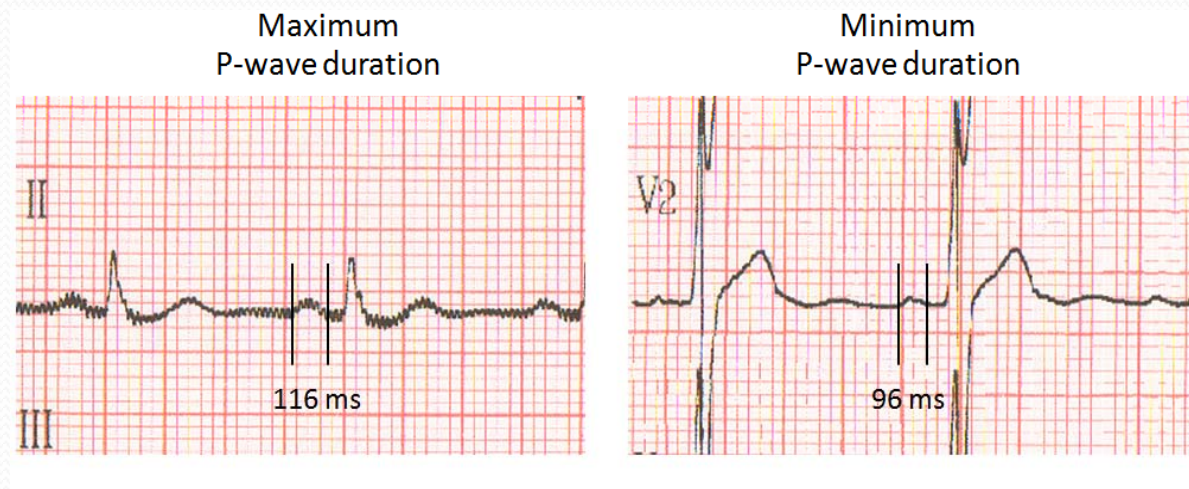saving, and rea   essment and
grading the lef   c function.

Review of Related Literatures

- P-wave dispersion(PD)

  → correlates to left ventricular end diastolic pressure (LVEDP) and enables the calculation of AF risk on the 12-lead ECG

| Maximum P-wave duration | Minimum P-wave duration |
| 116 ms | 96 ms |

Dilaveris PE, et al. Clinical and electrocardiographic predictors of recurrent atrial fibrillation. Pacing Clin Electrophysiol 2000;23:352-8.
Dilaveris PE, et al. Simple electrocardiographic markers for the prediction of paroxysmal idiopathic atrial fibrillation. Am Heart J 1998;135(5 Pt 1):733-8.

Review of Related Literatures

The Relationship between P Wave Dispersion and Diastolic Dysfunction

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PD was increased when staging of left ventricular diastolic dysfunction(LVDD) increased but not shown statistical significant from stage 1 to stage 3 of LVDD

Characteristics	Stage 1: Prolonged Relaxation (n=22)		Stage 2: Pseudo-normalization (n=24)		Stage 3: Restrictive Pattern (n=27)		P Value
P wave dispersion (ms)	48	± 7	54	± 8	58	± 9	>0.05

Gunduz H, et al. The relationship between P wave dispersion and diastolic dysfunction.Texas heart institute journal. 2005;vol 32:No 2:163-167.

Review of Related Literatures

The Relationship between P Wave Dispersion and Diastolic Dysfunction in Patients with Significant and Insignificant Coronary Artery Disease

Randa A. Soliman., MD, Ahmed A. Battah., MD, Ayman Hekaal., MD Mohamed Ashraf., MD, Ashraf Wadei., MD.

Critical Care Medicine Department, Cairo University, Cairo, Egypt.

P wave dispersion did not show a significant change in the 3 stages of diastolic dysfunction in our small studied groups (N=58)

Randa A. et al. The relationship between P wave dispersion and diastolic dysfunction in patients with significant and insignificant coronary artery disease. Journal of American Science. 2010;6(9):438-445

Review of Related Literatures

Association of Stage of Left Ventricular Diastolic
Dysfunction with P Wave Dispersion
and Occurrence of Atrial Fibrillation after
First Acute Anterior Myocardial Infarction

Remzi Yilmaz, M.D.,* Recep Demirbag, M.D.,* Ismet Durmus, M.D.,†
Hasan Kasap, M.D.,† Merih Baykan, M.D.,† Mehmet Kucukosmanoglu, M.D.,†
Sukru Celik, M.D.,† and Cevdet Erdol, M.D.†

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Research Question

- Could 12 lead ECG (P dispersion) diagnosis and staging left ventricular diastolic dysfunction?

Research Design

- Cross-sectional design

Target Population

- Adult patients without prior history of cardiovascular disease (pacemaker , valvular and arrhythmia) who enrolled in EGAT study will be enrolled.

Sample size determination

- Sample size will be determine after pilot study.By paired t-test equation.

$$n = 1 + 2C\left(\frac{s}{d}\right)^2$$

- SD and d(difference) will achieved from the pilot study

Inclusion criteria

- Adult patients aged ≥ 15 years old who enrolled in EGAT study.

Exclusion criteria

- Adult patients with known heart disease

  - LVEF < 50%

  - rhythm other than sinus

  - more than mild valvular stenosis or regurgitation

  - prosthetic valve or pacemaker

- Poor window for echocardiogram
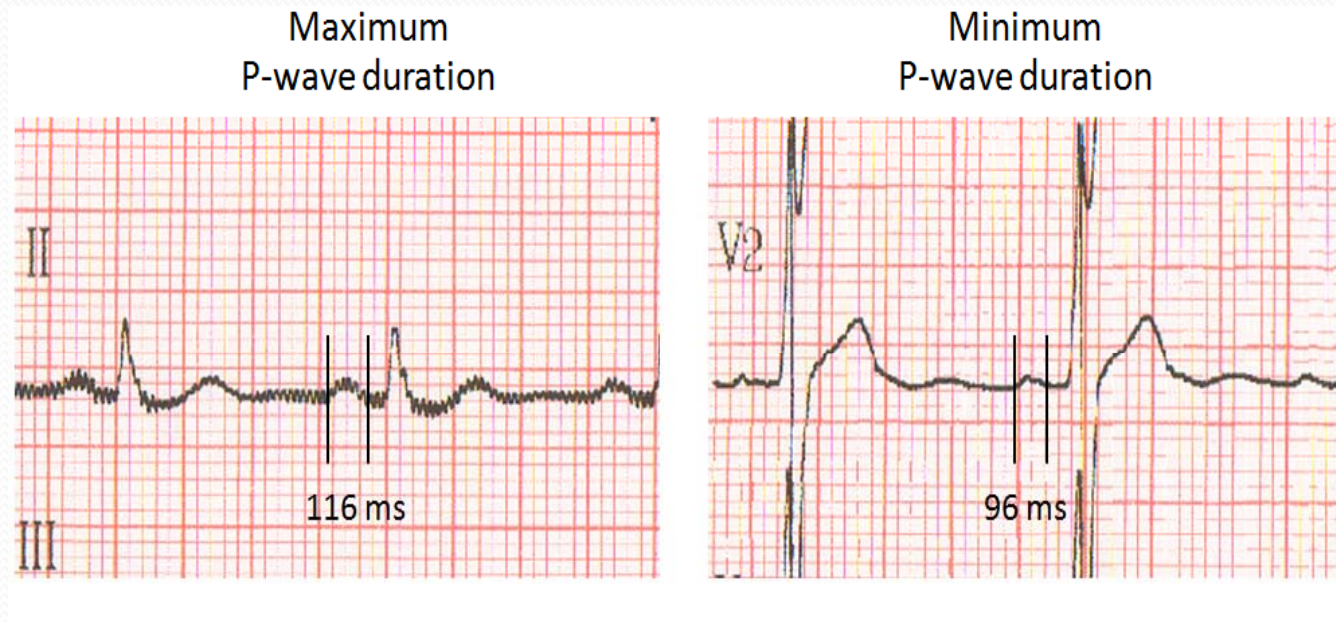- The beginning and the ending of the P-wave could not be clearly identified.

Material and method

- Echo parameters in evaluating LV systolic and diastolic function included:

    1.LVEF by 2D

    2.Tissue Doppler Imaging and mitral inflow

- Data

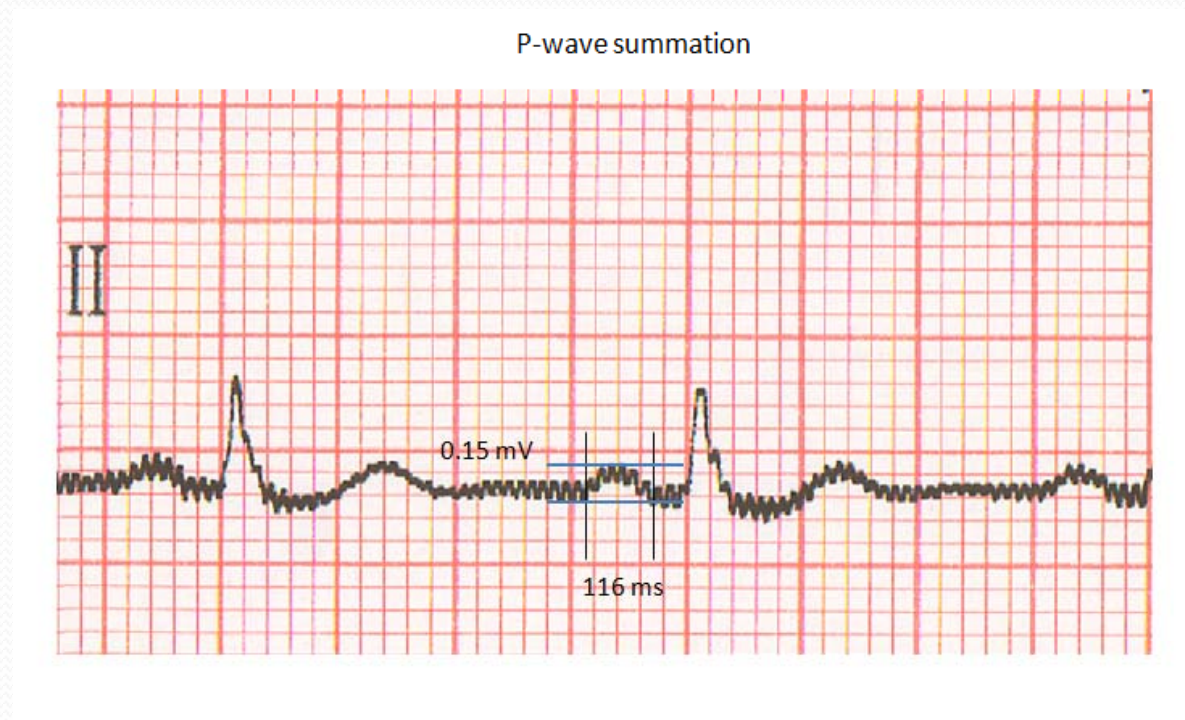   - demographic data (Age , sex , DM , HTN , DLP)

Material and method

- EKG

P wave dispersion

- ECGs were manually measured by the use of a magnifying photos and wonderwebwaqre ruler by two blinded technicians having no information about the patients.
- The beginning of the P wave was defined as the point where the initial deflection of the P wave crossed the isoelectric line, and the end of the P wave was defined as the point where the final deflection of the P wave crossed the isoelectric line.
- The difference between maximum and minimum P wave duration was defined as PWD.

Material and method

- EKG

Peak P-wave x 300   +   P wave duration in lead II

Material and method

- Adult patients without prior history of cardiovascular disease (pacemaker , valvular and arrhythmia) who enrolled in EGAT study will be enrolled.

Statistical analysis

- 1. Data

    :-frequencies and percent (categorical data), mean+SD (continuous data)

- 2. Compare positive group, negative group

    :-Chi-square test (categorical data), continuous data : t-test (normality) , or Mann-whitney U-test (non-normality)

- 3. Logistic Regression

-         :-(>1 variable significance)

- 4.Summary receive operating characteristic (SROC) curve for cut off level

Expected benefit and application

- 12 leads ECG can assessment and grading the left ventricular diastolic function ,that was easy, cost saving, and readily available.

Result

Demographics data

Variables	Value
Age (mean +/-SD)	68.84 +/-4.84
BMI (mean +/-SD)	24.81 +/-9.55
Male (N, %)	116 (49.8%)
DM (N, %)	51 (21.9%)
Htn (N, %)	114 (48.69%)
Lipid (N, %)	146 (62.7%)

Result

ECG

Variables	Value
P min	53.91 +/-14.06
P max	112.72 +/-16.51
P dispersion	58.81 +/-15.74
P duration in II	103.30 +/-19.81
P summation	146.88 +/-31.31

Result

Echo

Variables	Value
Medial E/e'	11.00 +/-3.45
Lateral E/e'	8.48 +/-2.71
Diastolic dysfunction (y/n)	226 (97.0%)
Diastolic function grading - 0 - 1 - 2	 7 (3.0%) 188 (80.7%) 38 (16.3%)

Result

Diastolic dysfunction vs. other variables

Variables	Normal Diastolic Function (N=7)	Abnormal Diastolic Function (N=226)	P value
Age	66.85 +/-4.09	68.90 +/-4.82	0.269
BMI	23.96 +/-3.76	24.84 +/-9.68	0.809
Male	3 (42.9%)	113 (50.2%)	0.701
DM	0 (0%)	51 (22.7%)	0.154
Htn	2 (28.6%)	112 (49.8%)	0.269
Lipid	4 (57.1%)	142 (63.1%)	0.747

Result

Diastolic dysfunction vs. other variables

Variables	Normal Diastolic Function (N=7)	Abnormal Diastolic Function (N=226)	P
P min	62.29 +/-21.52	53.64 +/-13.76	0.110
P max		2	0.276
P dispersion		3	0.776
P duration in II	114.43 +/-18.54	103.05 /-19.83	0.272
P summation	154.71 +/-26.32	146.63 +/-31.47	0.502

No significant

Result

Grading Diastolic function vs. other variables

Variables	Gr 0 (N=7)	Gr 1 (N=188)	Gr 2 (N=38)	P
Age	**66.85 +/-4.09**	**69.25 +/-4.91**	**67.18 +/-3.95**	**0.028**
BMI	23.95 +/-3.76	25.01 +/-10.42	23.99 +/-4.28	0.816

Variables	Gr 0 (N=7)	Gr 1 (N=188)	Gr 2 (N=38)	P
P min	62.28 +/-21.5	54.50 +/-13.67	49.42 +/-13.61	0.035
P dispersion	57.14 +/-23.06	57.94 +/-15.29	63.42 +/-16.12	0.142
P summation	154.71 +/-26.32	146.82 +/-33.11	145.70 +/-21.96	0.783

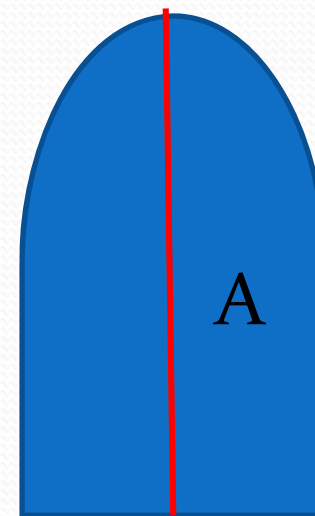| Variables	Gr 0 (N=7)	Gr 1 (N=188)	Gr 2 (N=38)	P
P duration in II	111.42 +/-18.53	103.33 +/-19.93	101.68 +/-19.52	0.491
P summation	154.71 +/-26.32	146.82 +/-33.11	145.70 +/-21.96	0.783
Medial E/e'	**7.02 +/-3.64**	**10.64 +/-2.97**	**13.52 +/-4.17**	**<0.0001**
Lateral E/e'	6.98 +/-1.96	8.26 +/-2.54	9.79 +/-3.15	0.002

Atrium

Diastolic grade 0

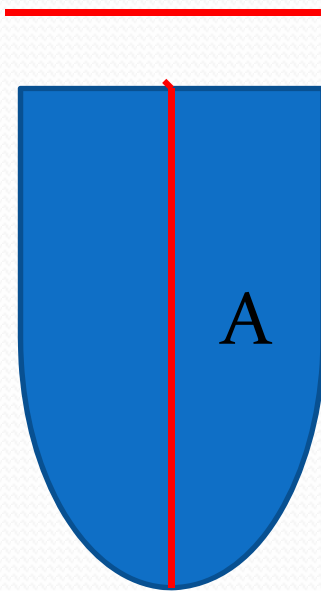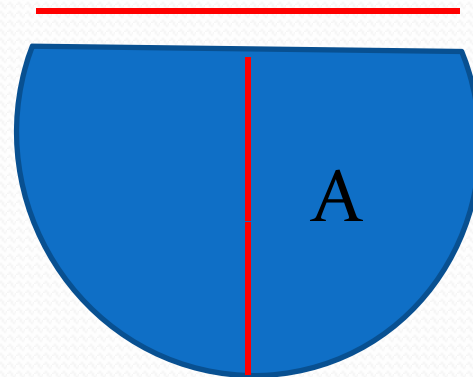Diastolic grade 2

$$\frac{A}{B}$$

Ventricle

Normal EF

Poor EF

B

$$\frac{A}{B}$$

B

A

A

Conclusion

- Minimum P wave duration, but not Psum or PD, was associated with the severity of DD in inverse relationship. The explanation may be from atrial fibrosis and may require further and larger studies.

Thank you