Results

Results

This study was conducted in order to evaluate the value of tissue Doppler parameters in estimation of pulmonary artery pressure in chronic obstructive pulmonary disease.

Fifty clinically stable chronic obstructive pulmonary disease patients were included in the work as a study group during the period from October 2007 to March 2008.

Twenty age and sex matched healthy persons were included in the work as a control group. Pulmonary hypertension diagnosed when (PASP) > 30mmHg. *(Melek et al., 2006)*

Patients were classified according to the presence or absence of significant tricuspid regurge and pulmonary hypertension (pulmonary artery systolic pressure> 30 mm Hg) into two groups:

Group I:

-Includes 23 COPD patients with significant tricuspid regurge and pulmonary hypertension (PASP> 40 mmHg)

Group II:

-Includes 27 COPD patients with out tricuspid regurge and with out pulmonary hypertension.

Control group:

-Includes 20 age and sex matched healthy persons as a control group.

• *Basic characteristic:*

Group I:

Pulmonary hypertensive group including 17 males and 6 females and the age ranged from 58 to 74 years, with a mean age of 65± 8 years.

Group II:

Patients with out pulmonary hypertension. Including 21 males and 6 females and the age ranged from 53 to 74 years, with a mean age of 63.8 ± 10.3.

Control group:

Twenty healthy persons Including 15 males and 5 females and the age ranged from 55 to 69 years with a mean age of 61.3 ± 7.9 years.

Comparison between the studied groups as regards to age and sex

	Control (N = 20)	Group I (N = 23)	Group II (N = 27)	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
Age mean ± SD	61.3 ± 7.7	62.7 ± 8	63.8 ± 10.3	P > 0.05
Sex: male %	15 (75%)	17 (73%)	21 (77%)	P> 0.05
Femal %	5 (25%)	6 (26%)	6 (23%)	

Table (4) Shows no statistically significant difference between control, group I and group II as regard to age and sex.

- *Pulmonary function test*

In Control group:

FEV_1% predicted

ranged from 36% to 57% with a mean of 49% $\pm$ 4.7.

FEV_1 (L)

ranged from 0.65 to 1.4 (L) with a mean of 0.88 $\pm$ 0.13(L).

FEV_1 / FVC %

ranged from 36% to 58% with a mean of 58.2% $\pm$ 6.1.

In Group I:

FEV_1% predicted

ranged from 26% to 42% with a mean of 32.5 $\pm$ 7.7.

FEV_1 (L)

ranged from 0.55L to 1.0L with a mean of 0.72L $\pm$ 0.14 .

FEV_1 / FVC %

ranged from 27% to 48% with a mean of 36.8 $\pm$ 7.4.

In Group II:

FEV_1% predicted

ranged from 39 to 51 with a mean of 46.6 $\pm$ 4.3.

FEV_1 (L)

ranged from 0.56 to 1.0 with a mean of 0.73 $\pm$ 0.23.

FEV_1 / FVC %

ranged from 39 to 55 with a mean of 45.5 $\pm$ 10.5.

As regards to pulmonary function tests there was statistically significant difference between COPD (group I and group II) and control group, as FEV_1%, FEV_1 (L) and FEV_1/ FVC% were lower in patients with COPD (group I and group II) in comparison with control group. P value <0.05.

Comparison between the studied groups as regards to pulmonary function

	Control (N = 20)	Group I (N = 23)	Group II (N = 27)	P Value
	Mean ± SD	Mean ± SD	Mean ± SD	
FEV_1% predicted	49 ± 4.7	32.5 ± 7.7	46.6 ± 4.3	P <0.05
FEV_1 (L)	0.88 ± 0.13	0.72 ± 0.14	0.73 ± 0.23	P <0.05
FEV_1 / FVC%	58.2 ± 6.1	36.8 ± 7.4	45.5 ± 10.5	P< 0.05

Table (5): Shows significant statistical difference between control group, group I & group II as regards to pulmonary functions.

- *Echocardiographic parameters*

Left ventricular end diastolic diameter (LVDD), left ventricular end systolic diameter (LVSD), ejection fraction (EF%).

Comparison between the studied groups as regards to Echocardiographic parameters

	Control (N = 20)	Group I (N = 23)	Group II (N = 27)	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
LVDD	42 ± 4.3	43 ± 4.8	42.2 ± 4.3	P > 0.05
LVSD	29 ± 3.7	29 ± 3.3	29 ± 3.7	P > 0.05
LVEF	68.8 ± 8.9	69.4 ± 8.2	70 ± 8	P > 0.05

Table (6): Shows no statistically significant difference between control group, group I and group II. P> 0.05.

- ### *Right ventricular end diastolic diameter (RVDD):*

Comparison between the studied groups as regards to Right ventricular end diastolic diameter (RVDD)

	Control (N = 20)	Group I (N = 23)	Group II (N = 27)	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
RVDD mm	25.4 ± 5.3	30.2 ± 5.2	25.1 ± 2.5	P < 0.05

Table (7): Shows statistically significant difference between control group, group I and group II. P< 0.05.

Tissue Doppler parameters

a) Systolic pulsed tissue Doppler Imaging parameters of lateral annulus of The tricspid valve :

- ## Systolic myocardial velocity (Sm)

In Control group :

Sm is ranged from 12.8 to 16 cm/s with a mean of 14.4± 1.6 cm/s.

In Group I:

Sm is ranged from 8.7 to 10.6 with a mean of 9.7 ± 0.93 cm/s.

In group II:

Sm is ranged from 12.4 to 15.8 with a mean of 14.2 ± 1.6 cm/s.

Comparison between control group and group I as regards to Systolic myocardial velocity (Sm)

	Control (N = 20)	Group I (N = 23)	P Value
	Mean $\pm$ SD	Mean $\pm$ SD	
Sm cm/s	14.4 ± 1.6	9.7 ± 0.93	< 0.01

Table (8): Shows high statistically significant difference between control group and group I as regards to Systolic myocardial velocity (Sm).
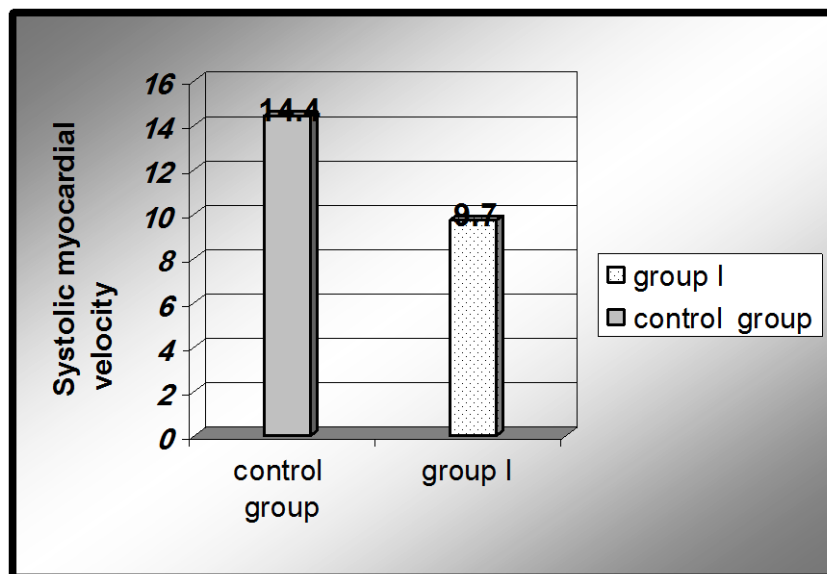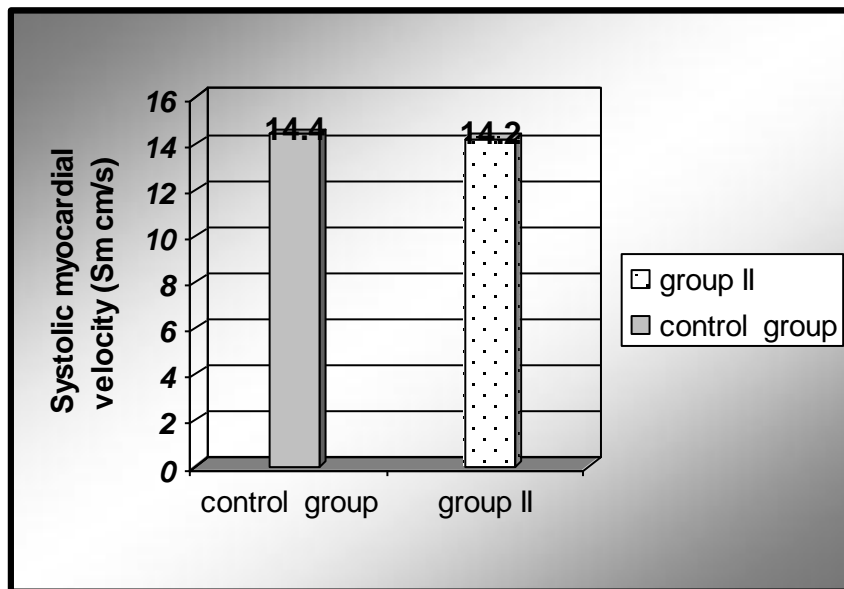

Figure (9): Shows high statistically significant difference between control group and group I as regards to Systolic myocardial velocity (Sm).

Comparison between control group and group II as regards to

Systolic myocardial velocity (Sm)

	Control (N = 20)	Group II (N = 27)	P Value
	Mean ± SD	Mean ± SD	
Sm cm/s	14.4 ± 1.6	14.2 ± 1.6	> 0.05

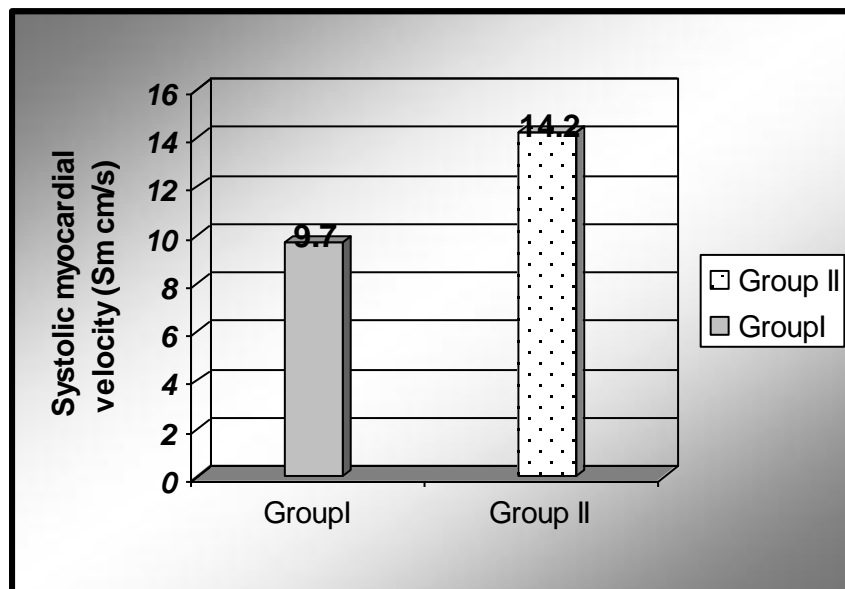**Table (9):** Shows no difference between control group and group II as regards to Systolic myocardial velocity (Sm).

Figure (10): Shows no difference between control group and group II as regards to Systolic myocardial velocity (Sm).

Comparison between group I and group II as regards to

Systolic myocardial velocity (Sm)

	Group I (N = 23)	Group II (N = 27)	P Value
	Mean ± SD	Mean ± SD	
Sm cm/s	9.7 ± 0.93	14.2 ± 1.6	< 0.001

Table (10): Shows high statistically significant difference between group I and group II as regards to Systolic myocardial velocity (Sm).

Figure (11): Shows high statistically significant difference between group I and group II as regards to Systolic myocardial velocity (Sm).

- *Velocity time integral of Sm (SmVTi):*

In Control group:

SmVTi is ranged from 2.6 to3.2 cm with a mean of 2.9 ± 0.12cm.

In Group I:

SmVTi is ranged from 1.1 to 2.4 cm with a mean of 1.9 ± 0.38 cm.

In group II:

SmVTi is ranged from 2.6 to 3.1 with a mean of 2.9 ± 0.21 cm.

Comparison between control group and group I as regards to Velocity time integral of sm (smVTi)

	Control (N = 20)	Group I (N = 23)	P Value
	Mean ± SD	Mean ± SD	
Sm Vti$_{cm}$	2.9 ± 0.12	1.9 ± 0.38	< 0.01

Table (11): Shows high statistically significant difference between control group and group I as regards to Velocity time integral of sm (smVTi)
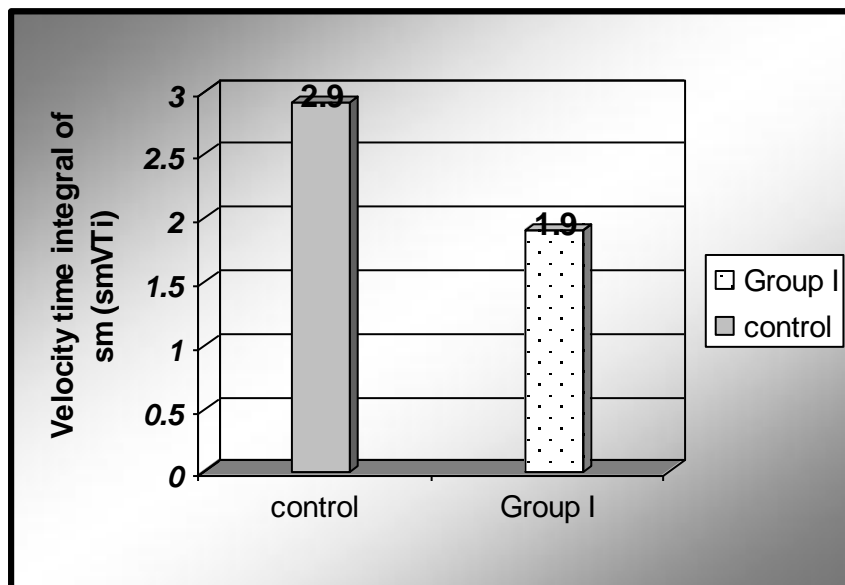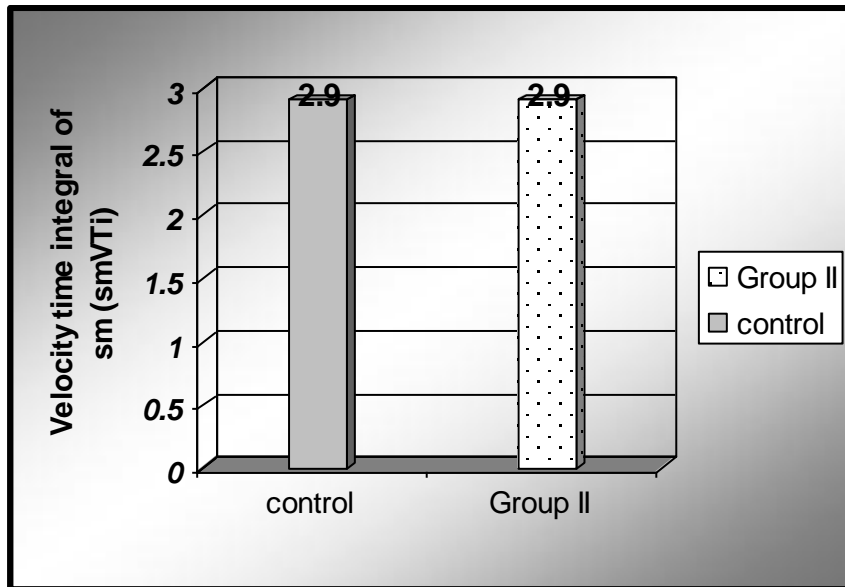

Figure (12): Shows high statistically significant difference between control group and group I as regards to Velocity time integral of sm (smVTi)

Comparison between control group and group II as regards to

Velocity time integral of Sm (SmVTi)

	Control (N = 20)	Group II (N = 23)	P Value
	Mean ± SD	Mean ± SD	
Sm VTi$_{cm}$	2.9 ± 0.12	2.9 ± 0.21	> 0.05

Table (12): Shows no difference between control group and group II as regards to Velocity time integral of sm (SmVTi)
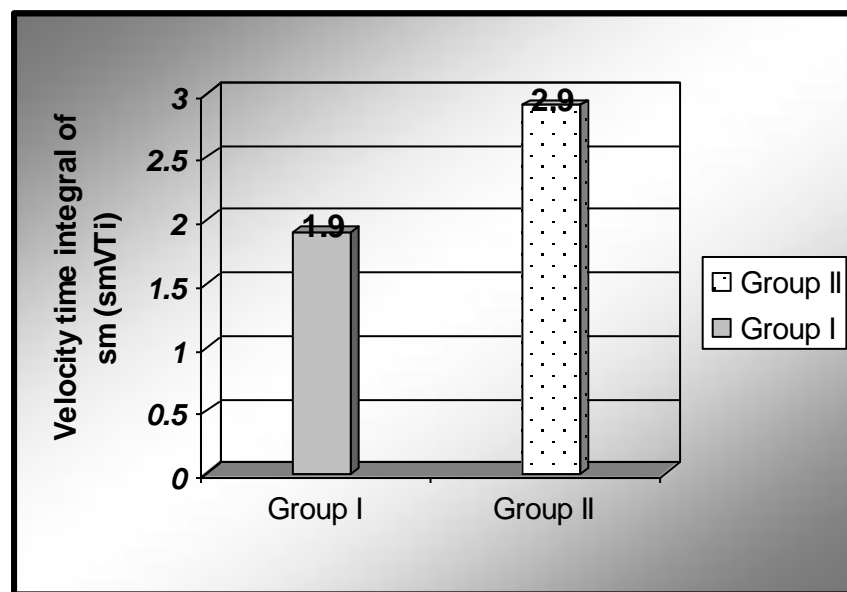

Figure (13): Shows no difference between control group and group II as regards to Velocity time integral of sm (SmVTi)

Comparison between group I and group II as regards to

Velocity time integral of Sm (SmVTi)

	Group I (N = 23)	Group II (N = 27)	P Value
	Mean ± SD	Mean ± SD	
Sm VTi$_{cm}$	1.9 ± 0.38	2.9 ± 0.21	< 0.01

Table (13): Shows high statistically significant difference between group I and group II as regards to Velocity time integral of Sm (SmVTi)

Figure (14): Shows high statistically significant difference between group I and group II as regards to Velocity time integral of Sm (SmVTi)

- ***Isovolumic contraction time (ICTm)***

In Control group:

ICTm is ranged from 26 to 102 ms with a mean of 72.7± 23.3 ms.

In Group I:

ICTm is ranged from 26 to 105 ms with a mean of 70.9 ± 24 ms.

In Group II:

ICTm is ranged from 25 to 105 ms with a mean of 71.4 ± 23 ms.

Comparison between the studied groups as regards to Isovolumic contraction time (ICTm)

	Control group (N = 20)	Group I (N = 23)	Group II (N = 27)	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
ICTM (ms)	72.7 ± 23.3	70.9 ± 24	71.4 ± 23	P > 0.05

Table (14): Shows no statistically difference between control group group I and group II as regards to Isovolumic contraction time (ICTm)
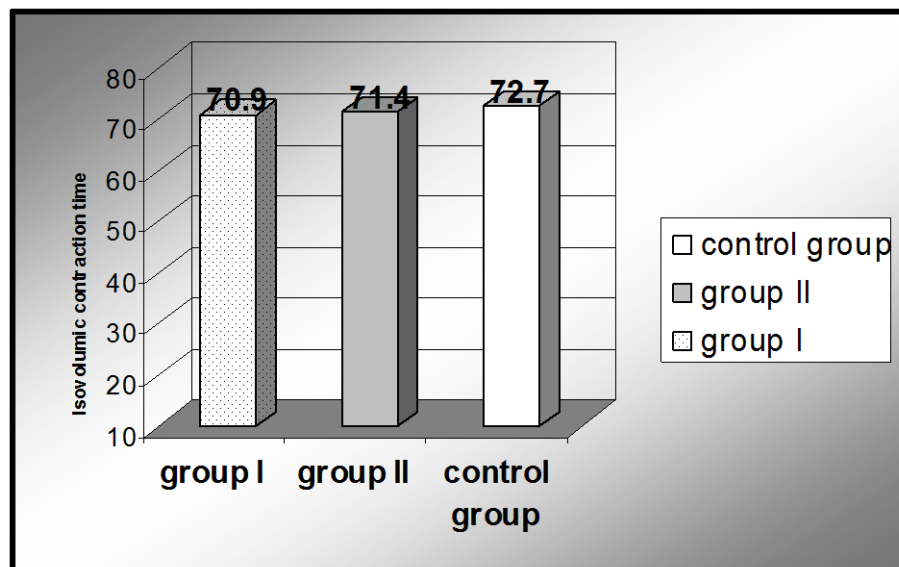
Figure (15): Shows no significant statistical difference between control group, group I and group II as regards to Isovolumic contraction time (ICTm).

b)diastolic pulsed tissue Doppler Imaging parameters of lateral, annulus of tricspid valve :

- *Myocardial isovolumic relaxation time IVRTm.*

  ### In Control group:
  IVRTm is ranged from 49 to 67 cm/s with a mean of55.9±5.9 ms

  ### In Group I:
 *IVRTm* is ranged from 64 to 101 ms with a mean of82.9 ±5.9 ms.

  ### In Group II:
  IVRTm is ranged from 52 to 61 with a mean of 57.04 ± 5.1 ms.

Comparison between control group and group I as regards to Myocardial isovolumic relaxation time IVRTm

	Control (N = 20)	Group I (N = 23)	P Value
	Mean ± SD	Mean ± SD	
IVRTm ms	55.9 ± 59	82.4 ± 9.4	P< 0.01

Table (15): Shows high statistically significant difference between control group and group I as regards to Myocardial isovolumic relaxation time IVRTm
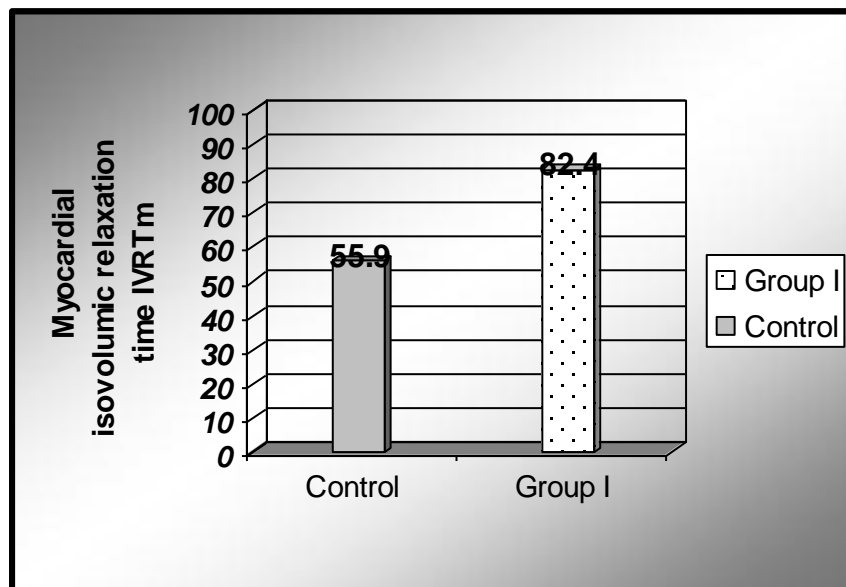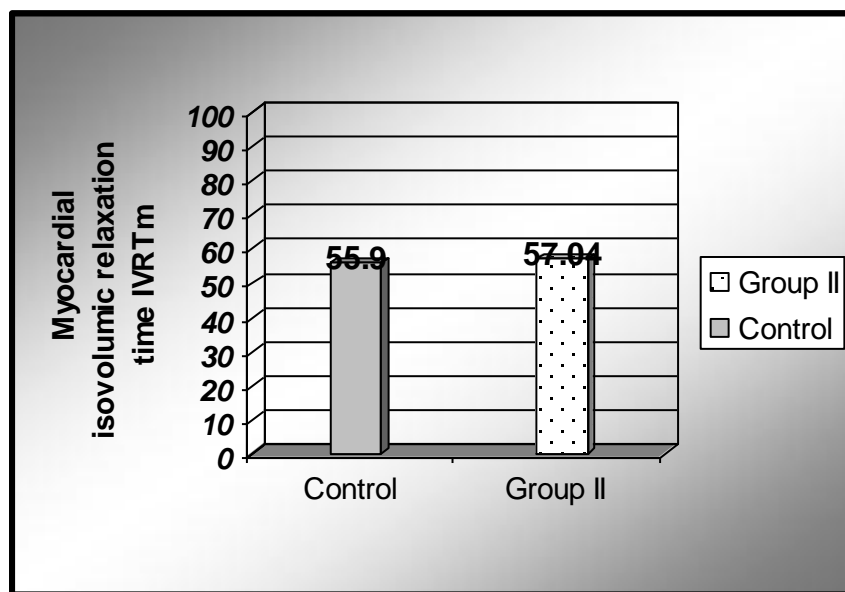

Figure (16): Shows high statistically significant difference between control group and group I as regards to Myocardial isovolumic relaxation time IVRTm

Comparison between control group and group II as regards to

Myocardial isovolumic relaxation time IVRTm

	Control (N = 20)	Group II (N = 23)	P Value
	Mean ± SD	Mean ± SD	
IVRTm ms	55.9 ± 59	57.4 ± 5.1	> 0.05

Table (16): Shows no statistically difference between control group and group II as regards to Myocardial isovolumic relaxation time IVRTm
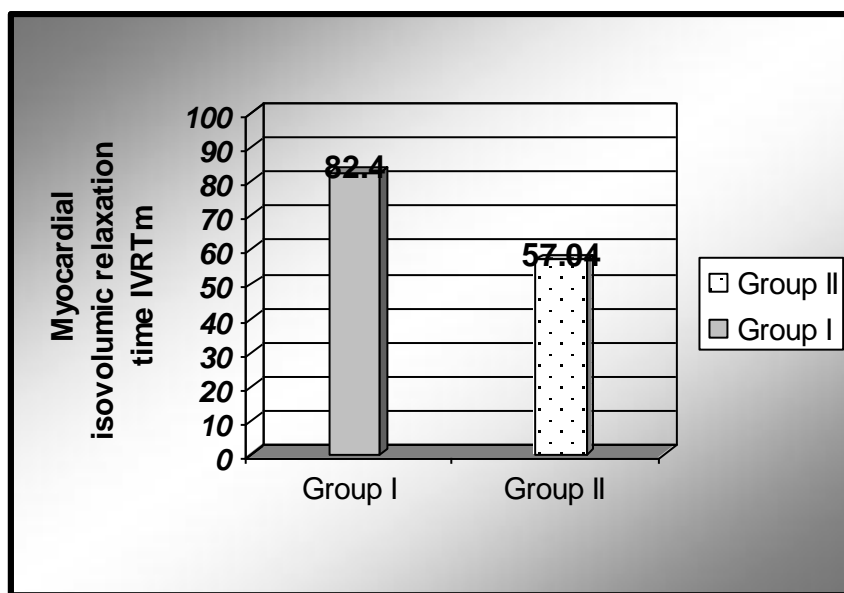

Figure (17): Shows no statistically difference between control group and group II as regards to Myocardial isovolumic relaxation time IVRTm

Comparison between group I and group II as regards to

Myocardial isovolumic relaxation time IVRTm

	Group I	Group II	P Value
	Mean ± SD	Mean ± SD	
IVRTm cm	82.4 ± 9.3	57.04 ± 5.1	< 0.01

Table(17): Shows high statistically significant difference between group I and group II as regards to Myocardial isovolumic relaxation time IVRTm.

Figure(18): Shows high statistically significant difference between group I and group II as regards to Myocardial isovolumic relaxation time IVRTm .

- *Eearly diastolic myocardial velocity (Em):*

In Control group:

Em (cm/s)is ranged from 12.9 to15.5cm/s with a mean of 14 ± 0.91 ms.

In Group I:

Em(cm/s)is ranged from 6.7to10.6 cm/s with a mean of8.8 $\pm$ 1.5 cm/s.

In Group II:

Em (cm/s) is ranged from 9.6to15.2 cm/s with a mean of 13.8±1.3cm/s.

Comparison between control group and group I as regards to

Eearly diastolic myocardial velocity

	Control (N = 20)	Group I (N = 23)	P Value
	Mean ± SD	Mean ± SD	
Em (cm/s)	14 ± 0.91	8.8 ± 1.5	< 0.05

Table (18): Shows statistically significant difference between control group and group I as regards to Eearly diastolic myocardial velocity.
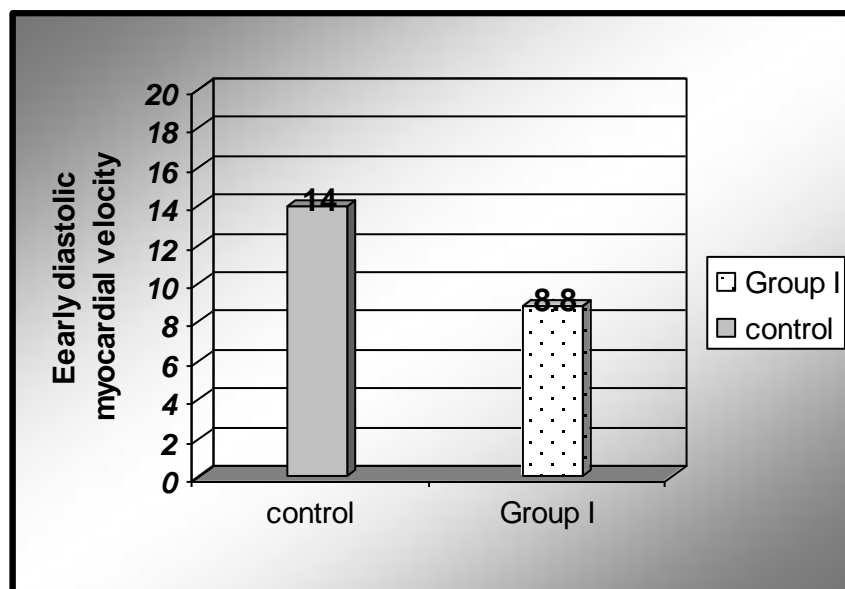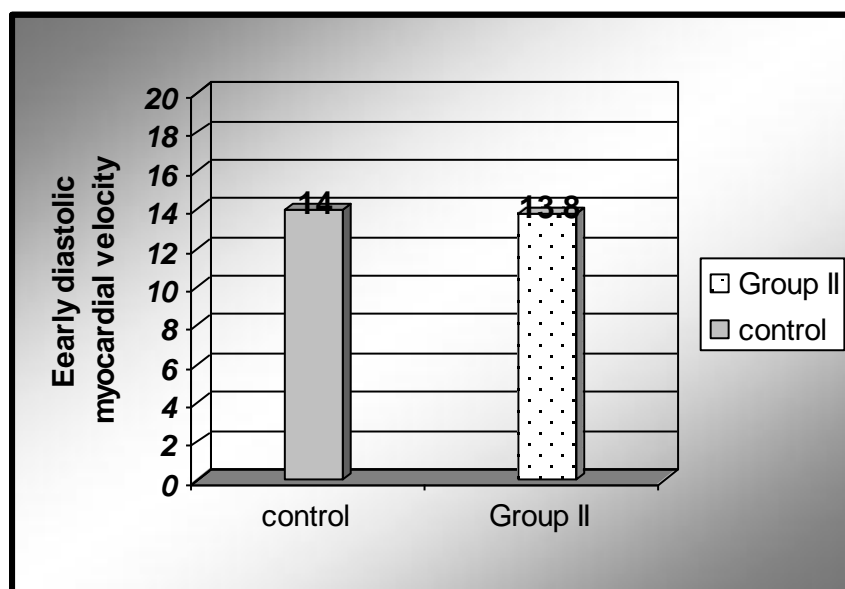

Figure (19): Shows statistically significant difference between control group and group I as regards to Eearly diastolic myocardial velocity.

Comparison between control group and group II as regards to

Eearly diastolic myocardial velocity

	Control (N = 20)	Group II (N = 23)	P Value
	Mean ± SD	Mean ± SD	
EM (cm/s)	14 ± 0.91	13.8 ± 1.3	> 0.05

Table (19): Shows no statistically difference between control group and group II as regards to Eearly diastolic myocardial velocity.
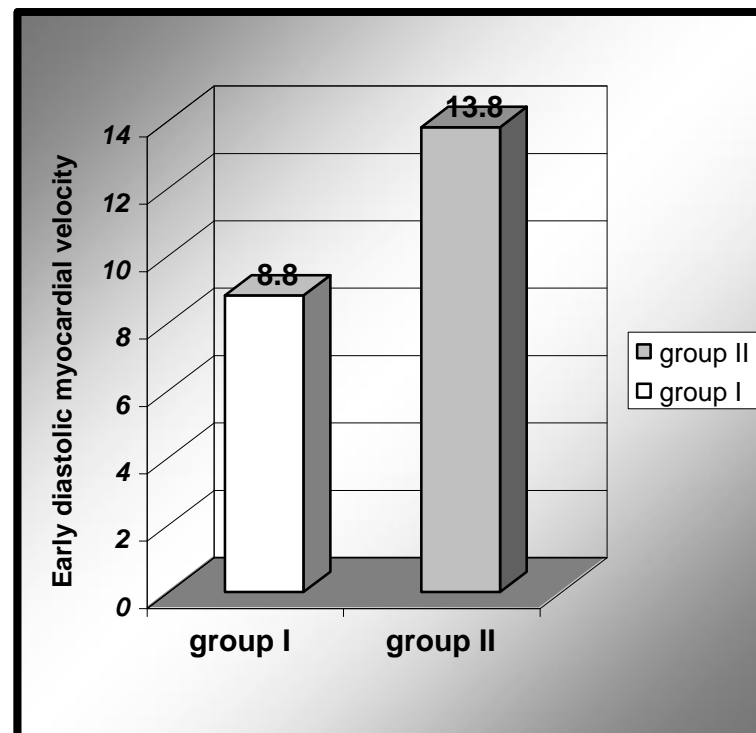

Figure (20): Shows no statistically difference between control group and group II as regards to Eearly diastolic myocardial velocity.

Comparison between group I and group II as regards to

Eearly diastolic myocardial velocity

	Group I (N = 23)	Group II (N = 27)	P Value
	Mean ± SD	Mean ± SD	
EM (cm/s)	8.8 ± 1.5	13.8 ± 1.3	< 0.01

Table (20): Shows high statistically significant difference between group I and group II as regards to Eearly diastolic myocardial velocity.

Figure (21): Shows high statistically significant difference between group I and group II as regards to Eearly diastolic myocardial velocity.

- *Early diastolic myocardial velocity to late diastolic myocardial velocity ratio (Em/Am):*

In Control group:

Em/Am is ranged from0.65%to1.03%with a mean of0.88%± 0.15%ms

In Group I:

Em/Am is ranged from 0.46 to 0.94 % with a mean of 0.56 ± 0.12 %.

In Group II:

Em/Am is ranged from0.74to1.04% with a mean of0.85 ±0.13 %.

Comparison between control group and group I as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio

	Control (N = 20)	Group I (N = 23)	P Value
	Mean ± SD	Mean ± SD	
Em/Am %	0.88 ± 0.15	0.56 ± 0.12	< 0.05

Table (21): Shows statistically significant difference between control group and group I as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio
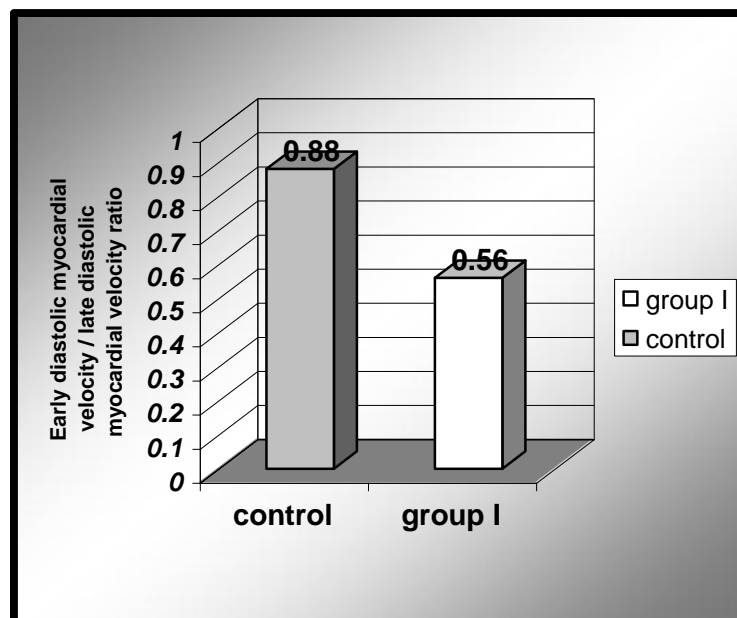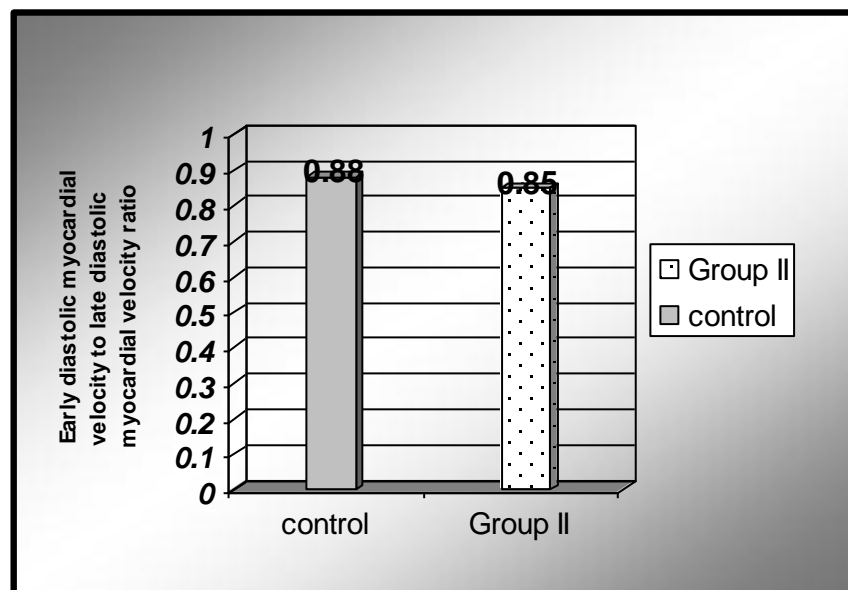

Figure (22): Shows statistically significant difference between control group and group I as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio

Comparison between control group and group II as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio

	Control (N = 20)	Group II (N = 27)	P Value
	Mean ± SD	Mean ± SD	
Em/Am %	0.88 ± 0.15	0.85 ± 0.13	> 0.05

Table (22): Shows no statistically difference between control group and group II as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio.
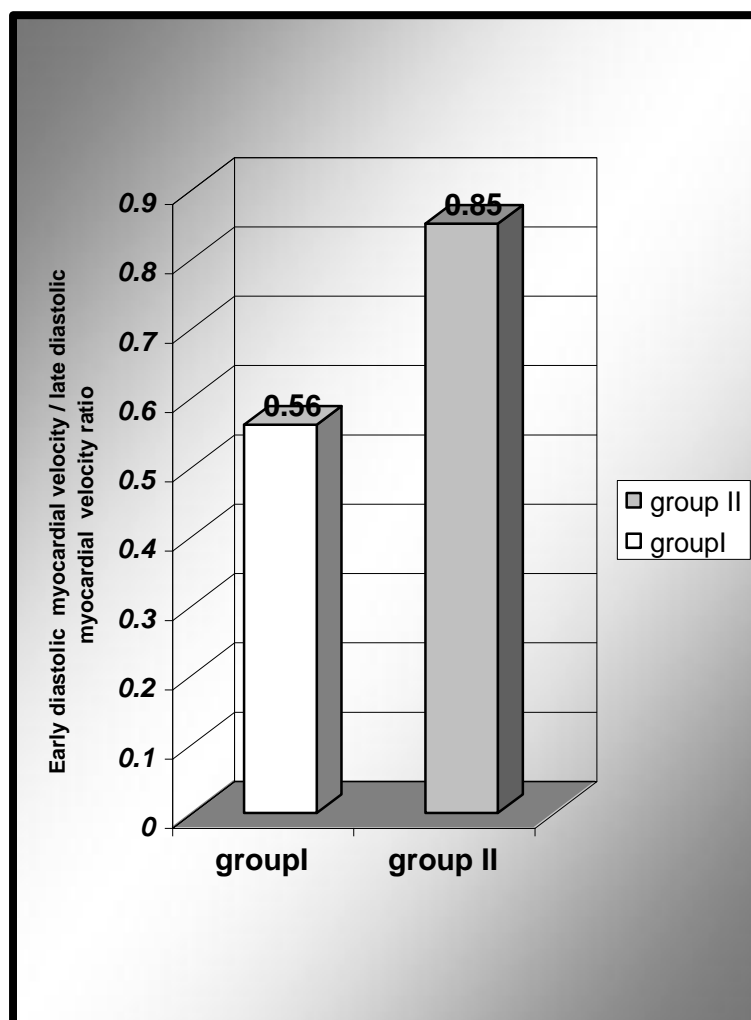

Figure (23): Shows no statistically difference between control group and group II as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio.

Comparison between group I and group II as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio

	Group I (N = 23)	Group II (N = 27)	P Value
	Mean ± SD	Mean ± SD	
Em/Am %	0.56 ± 0.12	0.85 ± 0.13	< 0.05

Table (23): Shows statistically significant difference between group I and group II as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio

Figure (24): Shows statistically significant difference between group I and group II as regards to Early diastolic myocardial velocity to late diastolic myocardial velocity ratio **.**

- *Late diastolic myocardial velocity (Am), Descerelation time of Em (DTm)*

In Control group:

Am-

Am is ranged from 13 to 16.5 ms with a mean of 14.9 ± 1.2 ms.

DTm-

DTm is ranged from 115 to 165 ms with a mean of135.5± 22 ms.

In Group I:

Am-

Am is ranged from 11 to 15.2 ms with a mean of 14.7 ± 1.3 ms.

DTm-

DTm is ranged from 115 to 165 ms with a mean of 133.5±25 ms.

In Group II:

Am-

Am is ranged from 9.2 to 17.1 ms with a mean of 13.8 ± 1.8 ms.

DTm-

DTm is ranged from 115 to 185 ms with a mean of136.5±25 ms.

Comparison between the studied groups as regards to Late diastolic myocardial velocity (Am), Descerelation time of Em (DTm)

	Control group (N = 20)	Group I (N = 23)	Group II (N = 27)	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
Am (ms)	14.9 ± 1.2	14.7 ± 1.3	13.8 ± 1.8	P > 0.05
DTm (ms)	135.5 ± 22	133.5 ± 25	136.5 ± 20	P> 0.05

Table (24): Shows no significant statistical difference between control group, group I and group II as regard to Am, DTm, ICTm p> 0.05.
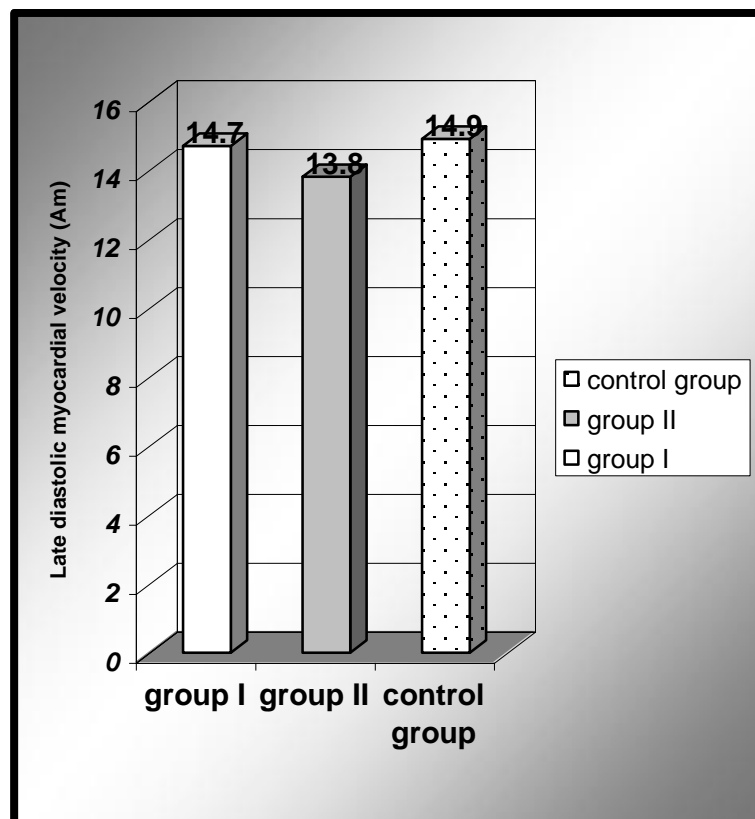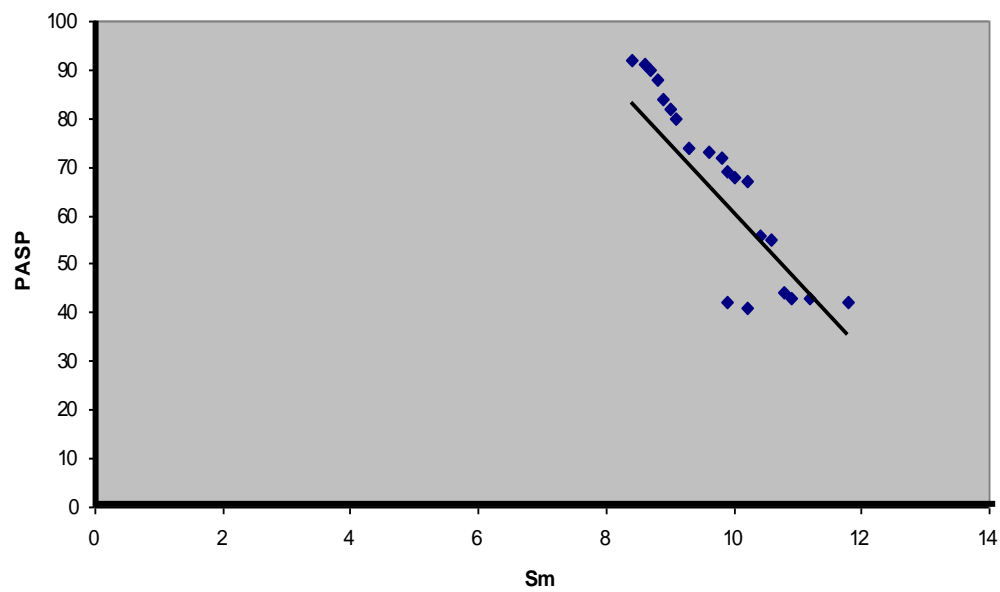

Figure (25): Shows no significant statistical difference between control group, group I and group II as regard to late diastolic myocardial velocity.
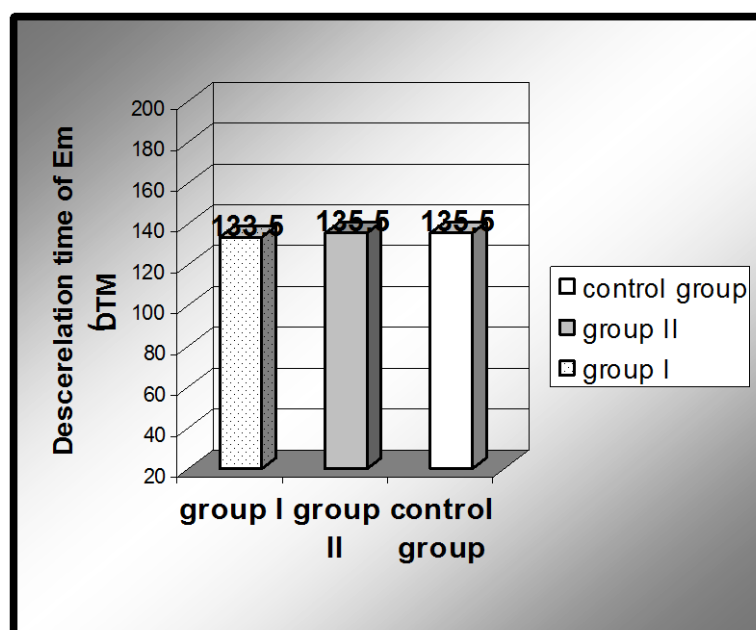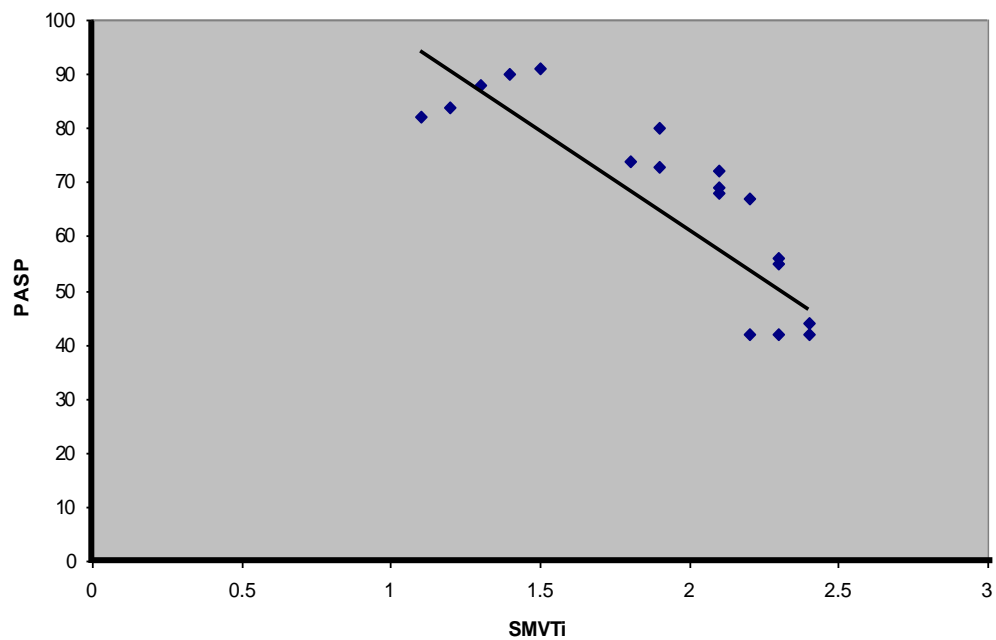
Figure (26): Show no significant statistical difference between control group, group I and group II as regard to descerelation time of Em (DTm).

Figure (27): Shows significant negative correlation between systolic myocardial velocity (Sm) and level of pulmonary artery systolic pressure (PASP) P< 0.001.

Figure (28): Shows significant negative correlation between velocity time integral of sm (SmVTI) and level of pulmonary artery systolic pressure (PASP) P< 0.001.

-88-
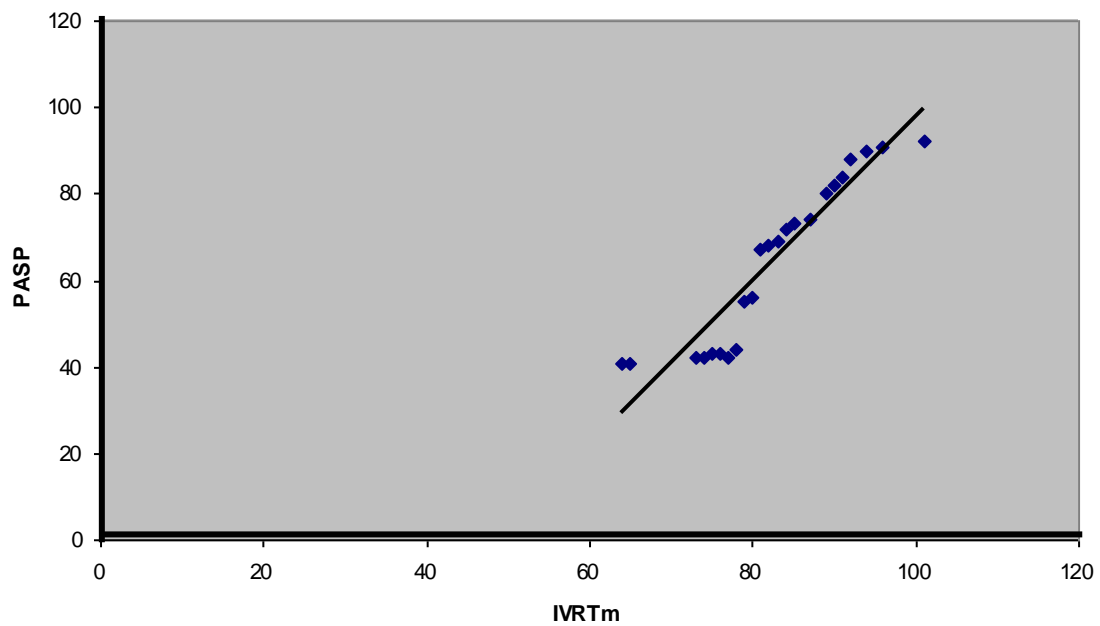
Figure (29): Shows significant positive correlation between myocardial isovolumic relaxation time (IVRT m) and level of pulmonary artery systolic pressure (PASP) P< 0.001.