STUDY OF CHANGES IN CARDIAC FUNCTION IN HEALTHY PREGNANT FEMALES USING 2D SPECKLE TRACKING ECHOCARDIOGRAPHY

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Introduction

Pregnancy is associated with important physiological changes in various systems of the human female including cardiovascular system. In most cases with uncomplicated pregnancy, these changes disappear after delivery.

Echocardiography is still of choice as an imaging modality that allows defining, risk stratifying and monitoring cardiovascular changes during pregnancy.

2D speckle tracking Echocardiography is a novel imaging quantitative technique to accurately estimate global and regional myocardial function with objective analysis of myocardial deformation.

Gestational changes in conventional echocardiographic measurements have been described, but normal changes in ventricular strain during pregnancy have not been yet fully investigated.

Aim of the work

The aim of this study is to assess changes in cardiac function in healthy pregnant females using 2D speckle tracking echocardiography as well as comparison with age-matched non-pregnant females as a control group.

Patients and Methods

A prospective, single-center, observational study was performed to include 60 consecutive healthy pregnant females presenting for routine antenatal care at El-Shatby Hospital and 60 age-matched healthy non-pregnant females as a control group. Transthoracic echocardiography was performed to the control group and cases in the baseline study during the first/second trimester and the follow up study during the third trimester. 2D speckle tracking echocardiography was performed for assessment of left ventricular global and segmental longitudinal strain and right ventricular free wall longitudinal strain after optimizing image quality, maximizing frame rate, and minimizing foreshortening.

Results

Table (1): Comparison of LV measurements between control group and cases at baseline and 3rd trimester according to ECHO (n=60)

There was a significant increase in LV volumes and dimensions towards the end of pregnancy.

ECHO Measurements	Control (n = 60)	cases (n = 60)		t2	P
		1st/2nd trimester	3rd trimester		
EF (%)					
Min. – Max.	59.0-72.0	55.0 – 68.0	60.0 – 70.0	16.096*	<0.001*
Mean ± SD.	65.32±3.78	61.95±2.66	65.47±2.31		
Median	66.0	62.0	65.0		
t1(p)		5.643*(<0.001*)	0.263 (0.793)		
LVEDV(Ml)					
Min. – Max.	80.0-96.0	76.0-107.0	87.0-127.0	24.558*	<0.001*
Mean ± SD.	89.40±3.76	92.72±7.21	107.23±9.18		
Median	90.0	93.0	106.50		
t1(p)		3.159* (0.002*)	13.928(<0.001*)		
LVESV (Ml)					
Min. – Max.	31.0-46.0	26.0-56.0	32.0-70.0	18.239*	<0.001*
Mean ± SD.	38.12±4.33	40.90±6.28	48.12±7.23		
Median	37.0	42.0	49.0		
t1(p)		2.826* (0.006*)	9.191*(<0.001*)		
LVIDd (mm)					
Min. – Max.	40.0-47.0	36.0-49.0	41.0-53.0	29.996*	<0.001*
Mean ± SD.	43.10±1.81	43.13±2.93	47.42±2.95		
Median	43.0	43.0	47.0		
t1(p)		0.075 (0.940)	9.652 (<0.001*)		
LVIDs (mm)					
Min. – Max.	22.0-29.0	21.0-36.0	25.0-39.0	22.751*	<0.001*
Mean ± SD.	26.12±2.02	28.03±2.56	31.52±2.59		
Median	27.0	28.0	32.0		
t1(p)		4.557*(<0.001*)	12.748(<0.001*)		

Table (2):Comparison of LVGLS measurement between control group and cases at baseline and 3rd trimester according to ECHO (n=60)

There was a significant decrease in LVGLS towards the end of pregnancy.

ECHO Measurements	Control (n = 60)	cases (n = 60)		t2	P
		1st/2nd trimester	3rd trimester		
LVGLS (-%)					
Min. – Max.	20.0-27.5	19.20-29.0	17.80-25.40	19.512*	<0.001*
Mean ± SD.	22.03±1.62	22.39±2.23	19.95±1.74		
Median	21.90	21.90	19.80		
t1(p)		1.011(0.314)	6.758*(<0.001*)		

Table (3):Comparison of RVFWLS measurement between control group and cases at baseline and 3rd trimester according to ECHO (n=60)

There was a significant decrease in RVFWLS towards the end of pregnancy.

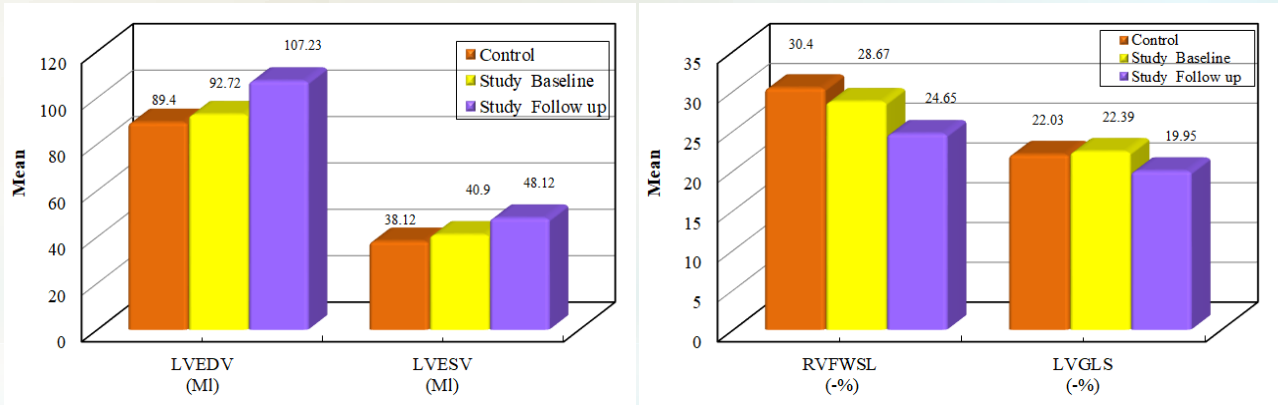| ECHO Measurements	Control (n = 60)	cases (n = 60)		t2	P
		1st/2nd trimester	3rd trimester		
RVFWSL (-%)					
Min. – Max.	23.5-39.9	20.50-37.0	18.70-32.0	16.754*	<0.001*
Mean ± SD.	30.40±3.97	28.67±4.12	24.65±3.31		
Median	29.8	28.15	24.55		
t1(p)		2.338* (0.021*)	8.614*(<0.001*)		

Figure (1): Comparison between control group and cases at baseline and 3rd trimester according to LVEDV(Ml) and LVESV (Ml).
There was a significant increase of LVEDV and LVESV towards the end of pregnancy with significant difference between baseline study and control group and 3rd trimester study and control group.

Figure (2): Comparison between control group and cases at baseline and 3rd trimester according to RVFWLS (-%) and LVGLS (-%).
There was a significant decrease in RVFWLS and LVGLS towards the end of pregnancy with a significant difference between baseline study and control group and between 3rd trimester study and control group in RVFWLS. Regarding LVGLS, there was no significant difference between baseline study and control group and there was a significant difference between 3rd trimester study and control group.

Conclusion

•Normal pregnancy is associated with a significant increase in left ventricular volumes and dimensions, LA dimension, RV basal diameter, mild valvular regurgitation (tricuspid, mitral regurgitation) and a small but significant increase of LVEF towards the end of pregnancy as measured by transthoracic echocardiography.

•Assessment by 2D speckle tracking echocardiography revealed a significant decrease of LVGLS and RVFWLS with progression of pregnancy as a normal finding during pregnancy