ROLE OF ULTRASOUND IN MORPHOLOGIC AND FUNCTIONAL ASSESSMENT OF FETAL HEART IN DIABETIC MOTHERS

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

[قالوا سبحانك لا علم لنا إلا ما علمتنا
إنك أنت العليم الحكيم]

صدق الله العظيم

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Abstract

Objective: To review the impact of maternal pre gestational and gestational diabetes on fetal cardiac morphology and function through assessment of cardiac structure, ventricular myocardial and septal hypertrophy and overall systolic and diastolic cardiac function using left modified myocardial performance index. ***Design:*** Case control study. ***Subjects:*** Twenty diabetic mothers and 30 control ones between 28 and 40 weeks gestational age. ***Methods:*** Fetal echocardiogram was done for diabetic patients, basic and extended basic cardiac exam for control cases. 2D measurement of end diastolic thickness of inter ventricular septum and ventricular myocardial free walls for all subjects with assessment of cardiac function using left modified myocardial performance index. ***Results:*** Statistically significant difference was detected between diabetic and control cases regarding septal and myocardial thickness denoting onset of fetal diabetic hypertrophic cardiomyopathy. Statistically significant left myocardial performance index between the 2 groups was found denoting impaired fetal cardiac overall systolic and diastolic function. One of the diabetic mothers was diagnosed with visceral heterotaxy syndrome (left isomerism). ***Conclusion:*** Maternal diabetes is strongly associated with fetal cardiac structural defects and should be considered as a high risk factor for congenital heart disease. Fetal cardiac hypertrophic cardiomyopathy with impairment of cardiac function occurs with maternal diabetes. Further research should focus on strict metabolic control of maternal diabetes as it may help in prevention of this functional impairment with postnatal follow up for evaluation of regression of cardiac condition on regular medical treatment.

Keywords:

Fetal echocardiography, Maternal diabetes, Hypertrophic cardiomyopathy, Myocardial performance index.

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List of Abbreviations

2D	**To-dimensional**
3D	**Three-dimensional**
4D	**Four-dimensional**
ADF	**Advanced dynamic flow**
AIUM	**American institute of ultrasound in medicine**
Ao	**Aorta**
APVS	**Absent pulmonary valve syndrome**
ARSA	**Aberrant right subclavian artery**
AS	**Aortic stenosis**
ASA	**Atrial septal aneurysm**
ASD	**Atrial septal defect**
AV	**Atrioventricular**
AVB	**Atrioventricular block**
AVNRT	**Atrioventricular nodal reentrant tachycardia**
AVRT	**Atrioventricular reentrant tachycardia**
AVSD	**Atrioventricular septal defect**
ccTGA	**Congenitally corrected transposition of the great arteries**
CDF	**Color Doppler flow**
CHD	**Congenital heart disease**
CHF	**Congestive heart failure**
CM	**Cardiomyopathy**
DORV	**Double-outlet right ventricle**
EDF	**End-diastolic flow**
EFE	**Endocardial fibroelastosis**
Hb.	**Hemoglobin**
HIFU	**High-intensity focused ultrasound**
HLHS	**Hypoplastic left heart syndrome**
HRHS	**Hypoplastic right heart syndrome**
Hz	**Hertz**
IAA	**Interrupted aortic arch**
IPT	**Intraperitoneal transfusion**
ICT	**Isovolumic contraction time**
IRT	**Isovolumic relaxation time**
ISUOG	**International Society of Ultrasound in Obstetrics and gynecology**
IVC	**Inferior vena cava**
IVS	**Intact ventricular septum**
IVT	**Intravascular transfusion**
KHz	**Kilohertz**
LAI	**Left atrial isomerism**

LSVC	**Left superior vena cava**
LVNC	**Left ventricular non-compaction cardiomyopathy**
LVOT	**Left ventricular outflow tract**
MHz	**Megahertz**
MI	**Mechanical index**
MPI	**Myocardial performance index**
RVWT	**Right ventricular wall thickness**
MPa	**Megapascal**
MR	**Mitral regurgitation**
NC	**Non-compaction**
PA	**Pulmonary artery**
PA: IVS	**Pulmonary atresia with intact ventricular septum**
PDU	**Power Doppler ultrasound**
PI	**Pulsatility index**
PJRT	**Permanent junctional reciprocating tachycardia**
PR	**Pulmonary regurgitation**
PS	**Pulmonary stenosis**
PSV	**Peak systolic velocity**
PSVT	**Paroxysmal supraventricular tachycardia**
PZT	**Lead zirconate titanate**
RAA	**Right aortic arch**
RAI	**Right atrial isomerism**
RI	**Resistance index**
ROI	**Region of interest**
RVOT	**Right ventricular outflow tract**
SD	**Standard deviation**
SIV	**Situs inversusus**
SonoAVC	**Sonographic automated volume calculation**
STIC	**Spatio-temporal image correlation**
SV	**Single ventricle**
SVC	**Superior vena cava**
SVT	**Supraventricular tachycardia**
TA	**Tricuspid atresia**
TAPVC	**Total anomalous pulmonary venous connection**
TCI	**Tissue compound imaging**
TDI	**Tissue Doppler imaging**
Tei	**Myocardial performance index**
TF4	**Tetralogy of Fallot**
TGA	**Transposition of the great arteries**
TI	**Thermal index**
TIB	**Thermal index for bone**
TIC	**thermal index for cranial bone**

TIS	**Thermal index for soft tissue**
TR	**Tricuspid regurgitation**
TUI	**Tomographic ultrasound imaging**
US	**Ultrasound**
VCAD	**Volume computer aided diagnosis**
VCI	**Volume contrast imaging**
VOCAL	**Volume computer aided analysis**
VOI	**Volume of interest**
VSD	**Ventricular septal defect**
LVWT	**Left ventricular wall thickness**
IVST	**Interventricular septal thickness**

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