

ROLE OF ULTRASOUND IN DIAGNOSIS OF MAJOR AND MODERATE FORMS OF FETAL CONGENITAL HEART DEFECTS

THESIS

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ مِنْ سُلَالَةٍ مِّنْ طِينٍ {12}
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List of Abbreviations

2D	two-dimensional	MPa	megapascal
3D	three-dimensional	MR	mitral regurgitation
4D	four-dimensional	NC	Non-compaction
ADF	advanced dynamic flow	PA	pulmonary artery
AIUM	American institute of ultrasound in medicine	PA: IVS	pulmonary atresia with intact ventricular septum
Ao	Aorta	PDU	power Doppler ultrasound
APVS	absent pulmonary valve syndrome	PI	pulsatility index
ARSA	aberrant right subclavian artery	PJRT	permanent junctional reciprocating tachycardia
AS	aortic stenosis	PR	pulmonary regurgitation
ASA	atrial septal aneurysm	PS	pulmonary stenosis
ASD	atrial septal defect	PSV	peak systolic velocity
AV	atrioventricular	PSVT	paroxysmal supraventricular tachycardia
AVB	atrioventricular block	PZT	Lead zirconate titanate
AVNRT	atrioventricular nodal reentrant tachycardia	RAA	right aortic arch
AVRT	atrioventricular reentrant tachycardia	RAI	right atrial isomerism
AVSD	atrioventricular septal defect	RI	resistance index
ccTGA	congenitally corrected transposition of the great arteries	ROI	region of interest
CDF	color Doppler flow	RVOT	right ventricular outflow tract
CHD	congenital heart disease	SD	standard deviation
CHF	congestive heart failure	SIV	situs inversus
CM	cardiomyopathy	SonoAVC	sonographic automated volume calculation
DORV	double-outlet right ventricle	STIC	spatio-temporal image correlation
EDF	end-diastolic flow	SV	Single ventricle
EFE	endocardial fibroelastosis	SVC	superior vena cava
Hb.	hemoglobin	SVT	Supraventricular tachycardia
HIFU	high-intensity focused ultrasound	TA	tricuspid atresia
HLHS	hypoplastic left heart syndrome	TAPVC	total anomalous pulmonary venous connection
HRHS	hypoplastic right heart syndrome	TCI	tissue compound imaging
Hz	Hertz	TDI	tissue Doppler imaging
IAA	interrupted aortic arch	Tei	myocardial performance index
IPT	intraperitoneal transfusion	TF4	tetralogy of Fallot
ICT	isovolumic contraction time	TGA	transposition of the great arteries
IRT	isovolumic relaxation time	TI	thermal index
ISUOG	International Society of Ultrasound in Obstetrics and gynecology	TIB	thermal index for bone
IVC	inferior vena cava	TIC	thermal index for cranial bone
IVS	intact ventricular septum	TIS	thermal index for soft tissue
IVT	intravascular transfusion	TR	tricuspid regurgitation
KHz	kilohertz	TUI	tomographic ultrasound imaging
LAI	left atrial isomerism	US	ultrasound
LSVC	left superior vena cava	VCAD	volume computer aided diagnosis
LVNC	left ventricular non-compaction cardiomyopathy	VCI	volume contrast imaging
LVOT	left ventricular outflow tract	VOCAL	volume computer aided analysis
MHz	megahertz	VOI	volume of interest
MI	mechanical index	VSD	ventricular septal defect

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Abstract

Objective: To review the sonographic diagnostic criteria of the fetal congenital heart anomalies and to evaluate the prenatal incidence of fetal cardiac anomalies and also to determine the prenatal pattern of CHD among pregnant women attending the unit. **Design:** Retrospective observational study. Setting: Cairo University Fetal Medicine Unit. **Subjects:** 3666 pregnant women in the second and third trimesters were included in this study among patients attended Cairo University Fetal Medicine Unit in the period from January 2012 to April 2013. **Methods:** Retrospective review of the fetal congenital anomaly scans of all the 3666 pregnant women included in the study. All of these patients underwent the congenital anomaly scan to check for the integrity of the different fetal organs. **Results:** Out of the 3666 patients included in this study, 70 cases were diagnosed as major and moderate CHD with 1.9% as the estimated prevalence. There was no significant difference between male (17.1%) and female (18.6%) in this study. The major forms were ten folds higher than the moderate forms. The most common congenital anomalies diagnosed in this study were VSD (34.3%) then HLHS (21.4 %) followed by AVSD (20%) in order of frequency. In 55.7% of the cases there were associated anomalies with the ultrasound markers of chromosomal anomalies present in 34.3% of the cases. **Conclusion:** The prenatal pattern of CHD differs from its postnatal pattern with dominance of the severe forms. The prenatally diagnosed cases carry poorer prognosis than those diagnosed postnatally with high associations with other anomalies especially the chromosomal defects.

Introduction

The total prevalence of major congenital anomalies is 23.9 per 1,000 live births with the congenital heart defects being the most common non-chromosomal subgroup (*Dolk et al., 2010*).

The incidence of severe congenital heart disease that will require expert cardiologic care is quite stable at about 2.5 to 3/1,000 live births. The moderately severe forms of CHD probably account for another 3 per 1,000 live births making the incidence of moderate and severe forms of CHD about 6/1,000 live births (*Hoffman and Kaplan, 2002*).

Prenatal diagnosis is associated with decreased neonatal morbidity, including decreased use of mechanical ventilation, antibiotics, and emergent surgery. Advanced prenatal knowledge of an indication for cardiac surgery may allow for the optimization of factors beyond immediate neonatal resuscitation that affect neonate survival, including labor, delivery, and operative repair (*Levey et al., 2010*).

Congenital heart disease screening should be offered and performed in all pregnant women as more than 90 percent of congenital heart disease occurs in low risk population (*Ahmed et al., 2007*).

The basic and extended basic cardiac ultrasonographic examinations are designed to maximize the detection of congenital heart disease during a second-trimester scan (*Salomon et al., 2006*).

Severe congenital heart disease includes the majority of the patients who present as severely ill in the newborn period or early infancy. Some of these patients who die very early might not be included in studies that do not track every infant born. Moderate congenital heart disease requires expert care, but less intensive than severe forms. Mild congenital heart disease is the most numerous group. These patients are asymptomatic; many not have significant murmurs and often undergo early spontaneous resolution of their lesions (*Hoffman and Kaplan, 2002*).

Aim of the work

The purpose of this retrospective study is to review the sonographic diagnostic criteria of the fetal congenital heart anomalies and to evaluate the incidence of fetal cardiac anomalies in women attending kasr El-Aini Fetal Medicine Unit.

Review of Literature