TWO DIMENSIONAL AND THREE DIMENSIONAL ULTRASOUND SCREENING FOR CONGENITAL FETAL ANOMALIES IN THE FIRST AND SECOND TRIMESTER OF PREGNANCY

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By

Mona Saad Moghazy Ahmed Salman

MB. Bch, M.sc

Assistant Lecturer - Faculty of Medicine -Cairo University

Supervised by:

Prof. MOHAMED MOMTAZ AWAD

Professor of Obstetrics & Gynecology
Faculty of Medicine -Cairo University

Dr. MONA MOHAMED ABOULGHAR

Assistant Professor of Obstetrics & Gynecology
Faculty of Medicine- Cairo University

Dr. AHMAD ZAKARIA EL-SHEIKHAH

Assistant Professor of Obstetrics & Gynecology
Faculty of Medicine- Cairo University

Faculty of Medicine
Cairo University
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بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم"
آية ٣٢ البقرة

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List of Abbreviations

2D	Two dimensional
3D	Three-dimensional
4D	Four-dimensional
3D-US	Three-dimensional ultrasonography
AVSD	Atrioventricular septal defect
CCAM	congenital cystic adenomatoid malformation
CDH	Congenital diaphragmatic hernia
CHDs	Congenital Heart Defects
CNS	Central nervous system
CW	Continuous Wave
F&N	face and neck
GUN	GUN, genitourinary system
HDF	High Definition Flow
NTT	Nuchal translucency thickness
p value	probability value
PW	Pulsed Wave
ROI	Region of interest
SPSS	Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA
STIC	Spatio-Temporal Image Correlation Technique
TGA	transposition of great arteries
TOF	Teratology of Fallot
TOGV	transposition of great vessels
TOP	Termination of pregnancy
TUI	Tomographic ultrasound imaging
TUI	Tomographic ultrasound imaging
TUI	Tomographic ultrasound imaging mode
VCI^{TM}	volume contrast imaging
VOCAL	virtual organ computer-aided analysis
VSD	Ventricular septal defect
wks	weeks

Abstract

There has been a steep rise in the diagnostic capability of ultrasound over the last few years. With the availability of advanced ultrasound equipments and highly skilled trained operators, three-dimensional ultrasound is now becoming increasingly integrated in the assessment of fetus based on its potential advantage. Its potential advantages render this modality helpful but we need to test its accuracy and reliability.

The aim of our study was to determine if the examination of the 3D/4D volume datasets adds any diagnostic information to what is provided by 2D Ultrasound examination in relation to the definitive diagnosis which postnatal/postmortem examination.

In our study we compared the diagnostic information yielded from the use of 3D ultrasound to that of 2D in the diagnosis of fetal abnormalities in 146 women with anomalous fetuses

Key wards: Three dimensional – Two dimensional – anomalies

Introduction

Since its inception in the early 1950s, conventional two-dimensional has been the cornerstone of prenatal diagnosis of fetal malformations. However, over the last few years a steep rise in the diagnostic capability of ultrasound becomes recognized. This is attributed to the ongoing advances in technology and the sound availability of advanced ultrasound equipments and highly skilled trained operators. Three-dimensional ultrasound is considered one of the innovations of technology. It has now becoming increasingly integrated in the assessment of fetus based on its potential advantage. ***(Baba et al, 1999)***

One of the great advantages of 3D ultrasound is that the information remains captured as a volume and it is possible to reconstruct the recorded image and modify all the adjustments as if the patient was still present. This enables us to manipulate the image, re-rotate it three dimensionally and achieve another 3D reconstruction from the data already taken***. (Goncalves et al, 2005)***

In other words, this technology allows spatial analysis of the image viewed by the conventional 2D ultrasound through simultaneous assessment of areas of interest in the three orthogonal planes. Hence, the examiner's ability to ascertain a diagnosis while no longer restrained by limitations of the static 2D images. Moreover, it distinctively allows visualization of planes which might not be possibly obtained by the conventional 2D. ***(Kalache et al, 2006)***

These potential advantages combined with the simplicity of performing 3D volume manipulation following pre-defined structured steps render 3D ultrasound a potentially important tool. ***(Kurjak et al, 2007)***

Since it has been remained disputed the conflicting results in the literature regarding the accuracy of two-dimensional ultrasound in detecting major congenital anomalies ***(Lee et al, 2007),*** three-dimensional ultrasound can potentially be a valuable adjunct to 2D in the diagnostic process based on its advantages. However for the potential advantages to be realised then we have to define whether the analysis of 3D volumes is reliable.

We believe that the wide acceptance of 3D in clinical practice is based on studies that determine its accuracy as a modality in comparison with the standard 2D particularly in reference with the availability of postnatal confirmation of the anomalies suggested.

We therefore, compared the diagnostic information provided by 3D to that provided by 2D in the diagnosis of congenital anomalies in high risk patients and we then compared the data obtained with the postnatal/postmortem definitive diagnosis.