Role of Utilization of Three and Four Dimensional Ultrasonography in Evaluation of Fetal Central Nervous System

Essay

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Abbreviations

2D	Two dimensional
3D	Three dimensional
4D	Four dimensional
3HV	Three horn view
3V	Third ventricle
4V	Fourth ventricle
AGCC	Agenesis of corpus callosum
BC	Blake's pouch cyst
BS	Brain stem
CC	Corpus callosum
CM	Cisterna magna, Conus medullaris
CMV	Cytomegalovirus
CNS	Central Nervous System
CRL	Crown Rump Length
CS	Carnegie stage
CSD	Closed spinal dysraphism
CSF	Cerepro spinal fluid
CSP	Cavum septum pellucidum
IH	Inferior horn
ISUOG	International Society of Ultrasound in Obstetrics and Gynecology
LV	Lateral ventricle
MRI	Magnetic resonance imaging
NF	Nuchal fold
NTD	Neural tube defect
OSD	Open spinal dysraphism
ROI	Region of interest
SOP	Septo optic dysplasia
TUI	Tomographic Ultrasound Imaging
US	Ultrasonography

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Abstract

The multiplanar mode is used to navigate through the volume, observing information on a specific structure in all three orthogonal planes. Other display options, mainly the tomographic mode, are used to display the anomaly. The varieties of display modes and the infinite number of different planes that can be generated facilitate the diagnostic process. These imaging capabilities are extremely important during the first trimester of the pregnancy when manipulations with the vaginal probe are restricted and obtainable ultrasound sections are limited Additional values of this technology include an off-line analysis of the volume by the sonologist to obtain the necessary planes, as well as an electronic transmittal for an off-site expert to provide a second opinion consultation.

Key word

Three and Four Dimensional– AGCC- ISUOG- Ultrasonography- ROI

Introduction

Congenital abnormalities account for 20-25% of perinatal deaths. Now, many genetic and other disorders can be diagnosed early in pregnancy. Prenatal diagnosis uses various noninvasive and invasive techniques to determine the health of, the condition of, or any abnormality in an unborn fetus. Techniques of fetal visualization are:

a) Noninvasive techniques; Ultrasound, Fetal echocardiography,

Magnetic resonance imaging (MRI).

b)Invasive techniques; Embryoscopy, Fetoscopy ***(*Glenn, *2010).***

Central nervous system (CNS) malformations are the second most frequent category of congenital anomaly, after congenital heart disease. ***(Stevenson et al, 2008).*** Ultrasound (US) detection of prenatal central nervous system (CNS) anatomic anomalies is very important in making decision about therapeutic termination. It is a non-invasive technique, which is more acceptable by patients. Several studies have shown an accuracy of 92% to 99.7% for US detection of CNS anatomic anomalies ***(Tahmasebi et al, 2007).***

3D/4D ultrasonography has been used as an adjunctive imaging modality to 2D ultrasonography. Thus, the current paradigm consists of performing 3D/4D ultrasonography as part of a target scan, after an initial diagnostic impression has been established by 2D ultrasonography ***(Bornstein et al,2008).***

Three-dimensional (3D) ultrasonography has been increasingly used for examination of the human fetus. This technology allows examiners to move from a 3D mental reconstruction of two-dimensional (2D) images to actual 3D/4D visualization of anatomical structures ***(Tahmasebi et al,2007).***

Other potential benefits of 3D/4D ultrasonography in fetal neurosonography include:

(1) The ability to determine the severity, location and extent of central nervous system abnormalities.

(2)The possibility of reconstructing and visualising the corpus callosum in the sagital plane from volume data sets.

(3) The ability to visualise the 3 horns of the ventricular system in a single plane (3 horn view).

(4) The possibility of increasing the speed of fetal neurosonography performed by 2D transvaginal ultrsonography .

(5) The ability to review volume data interactively after the patient has left the examination room.

(6) The availability of a variety of rendering methods that allows visualization of different characteristics of the same structure.

(7) The possibility of rotating the volume dataset and examine anatomical structures from different perspectives.

(8) The ability to transmit data over networks for consultation in tertiary care centers and the potential to use offline software programs as an interactive educational tool ***(Bornstein et al, 2008).***

AIM OF WORK

The aim of this study is to determine the extended Imaging of 3D , 4D ultrasonography in prenatal assessment of anatomical structure of central nervous system and early diagnosis of the CNS congenital anomalies.