Role of Ultrasonography and Magnetic Resonance imaging in diagnosis of fetal brain anomalies

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Abstract

Ultrasound is still the first screening method in pregnancy and it will continue to be. Sonography remains the mainstay of fetal assessment.

However, MRI of the fetal CNS is evolving as a powerful tool for obtaining additional information with which selected patients and their

health-care professionals can make important management decisions. When a CNS anomaly is detected at US, MRI imaging may demonstrate additional findings that may alter patient counseling and case management.

Given its long record of safety, utility, and cost-effectiveness, ultrasound will remain the modality of choice when screening the fetus.

Ultrasound remains far too useful, effective, and widely available, and it also images in real time. Ultrasound is and will remain the primary fetal monitoring modality. A valuable complement to prenatal sonography, fetal MR imaging is a powerful technique used to evaluate the fetal brain. Fetal MR imaging has higher contrast resolution than prenatal sonography and allows better differentiation of normal from abnormal tissue.

Keywards:(Ultrasound, MRI, Fetal Brain anomalies).

INTRODUCTION

A Congenital anomaly was defined as ‘‘a permanent change produced by an intrinsic abnormality of development in a body structure during prenatal life. .A congenital anomaly may be viewed as a physical, metabolic, or anatomic deviation from the normal pattern of development that is apparent at birth or detected during the first year of life ***(Schroeder, 2013)***. It was reported that congenital anomalies occur in 3% of all infants worldwide. Congenital anomalies including structural malformations, chromosomal abnormalities and metabolic disorders are becoming the most important cause of perinatal mortality ***(Fida et al., 2007).***

Ultrasound is the primary technique for fetal imaging because of its proven utility, widespread availability & relatively low cost. However, US does have important limitations. First, it is uniquely operator- and interpreter-dependent ***(Glenn and Barkovich, 2012).*** In addition, relative to MRI, US provides a small field-of-view, and the resolution of US images is restricted by penetration through soft tissues and bone. Thus, the sensitivity of US in evaluating the fetus is reduced in obese patients and in women whose pregnancies are complicated by low amniotic fluid volume. Examination of intracranial anatomy is limited by the attenuation of the US beam through the bony skull in later gestation ***(Twickler et al., 2012).*** Finally, US quality is influenced by fetal position

(Garel and Alberti, 2012). A prone, breech fetus may be much more difficult to examine than a vertex supine fetus. If the head is low in the maternal pelvis, it may also be difficult to assess using US ***(Righini et al., 2011).***

A valuable complement to prenatal sonography, fetal MR imaging is a powerful technique used to evaluate the fetal brain. Fetal MR imaging has higher contrast resolution than prenatal sonography and allows better differentiation of normal from abnormal tissue. Structural abnormalities such as cerebral malformations and destructive lesions can be sonographically occult on prenatal sonography yet detectable by fetal MR imaging. Moreover, fetal MR imaging is not susceptible to many of the limitations of sonography. In addition, with continued advances in MR techniques, such as diffusion-weighted and parallel imaging, fetal MR imaging offers the promise of contributing to our understanding of normal as well as abnormal brain development ***(Kok et al., 2012).***

Fetal MR imaging is used primarily to confirm and characterize brain abnormalities detected by routine prenatal sonography. When a sonographically suspected abnormality is confirmed, fetal MR is also used to identify any additional sonographically occult CNS abnormalities ***(Coakley et al., 2012)***. One of the more common sonographically detected brain abnormalities, and therefore referral indications for fetal MR, is ventriculomegaly. Other common indications include sonographically suspected abnormalities of the corpus callosum

and cerebellar vermis as well as complications of monochorionic twin pregnancies ***(Raybaud et al., 2012).***

Fetal MR imaging has several advantages over prenatal sonography. Fetal MR imaging has improved contrast resolution compared with prenatal sonography. Moreover, fetal MR imaging also allows direct visualization of both sides of the fetal brain. This is an advantage over sonography, where the more anterior cerebral hemisphere is often shadowed by the reverberations from the overlying structures, resulting in visualization of only the more posterior cerebral hemisphere. Additional limitations of sonography, resulting from decreased amniotic fluid volume, fetal positioning, and acoustic shadowing from the ossifying calvaria, can also be overcome by fetal MR imaging. Thus, fetal MR imaging allows a more detailed evaluation of the developing brain, including direct visualization and assessment of the developing cortex and sulcation pattern, which is extremely difficult and often impossible with sonography ***(Aubryet al., 2013).***

With fast MRI sequences it is not necessary to sedate the fetus. It is advisable in cases where US is equivocal concerning congenital anomalies of the fetus to use MR with fast or ultrafast scan technique, especially when the central nervous system is concerned ***(Filly et al., 2012).***

AIM OF THE WORK

To evaluate the role of U/S & MR Imaging in detection of fetal brain anomalies.