

Evaluating the benefits of ultrasound over mri as an imaging modality for assessi...

[Law](#), [Evidence](#)



Abstract

The aim of this study is to examine benefits of ultrasound over MRI as an imaging modality for assessing fetal brain. This study establishes that these two imaging modalities mainly play matching roles. Several differences exist in relation to the laws, abilities, technology and guidelines governing abortion. These differences have a significant effect on how pathologists use prenatal imaging in their treatment procedures. Based on the roles that each method plays and other predetermined factors, a person has to select the most suitable and applicable imaging modality. The benefits and confines of the two imaging modalities when establishing a fetal brain are presented. This study further evaluates several pathological conditions and structural areas with an aim of highlighting certain contributions of every technique. A perfect prenatal approach of diagnosing cerebral anomalies is significant when implementing prenatal psychotherapy.

Introduction

This study examines the benefits of ultrasound (US) over MRI as an imaging modality for assessing fetal brain. In the practical prenatal practice, MRI popularity continues to develop for the last three years. Within this period, the value of MRI and ultrasound tools and exposure level among sonography and radiology has recorded a rapid improvement. The outcome has been a rapid reduction in the gap between sonography and radiology roles. The main area where fetal brain assessment remains prevalent is in fetal MRI, yet several factors are weighed in the process of examining the remaining parts of the fetal body. Based on the involvement anticipated from every method

and local working circumstances, it is important to select an imaging modality that is most suitable. A perfect prenatal diagnosis promotes accuracy in prenatal psychotherapy. This paper evaluates various pathological settings and anatomical regions with an aim of comparing the significance of each technique.

Literature review

Using MRI and Ultrasound to Diagnose Pathological Conditions

According to Sung (2010), performing fetal imaging takes several approaches. This researcher maintains that there exist several differences in regulations, laws, skills and techniques of terminating pregnancy and perception of women towards the process. The prevalence and exposure frequency of certain abnormalities that varies from one area to another reveals these differences. In several global regions, gynecologists are charged with the role of performing Ultrasounds. On the other side, the radiologists are charged with the role of performing MRI. However, the cases whereby the two modalities are performed by a radiologist or gynecologist are limited. From this argument, it is apparent that each profession remains unaware of challenges facing the other profession.

Sung (2010) insists that MRI and Ultrasound are two modalities that depend on an operator. The same case applies to each therapeutic activity. When it comes to prenatal ultrasound, it is hard to get perfect pictures in a structural plane that is similar to those acquired perinatal with MRI and CT imaging.

Unquestionably, respective specialists utilize images with an aim of determining functional laceration localization. This indication is significant in

several diagnosis processes. In relation to this issue, Prantl (2009) is among several researchers that maintain that ultrasound is more significant in numerous cases while maintaining that performing MRI remains impractical. Nevertheless, it is important to emphasize that, if only a limited number of people can use ultrasounds in detecting particular neurotic disorders, the technique remains undependable.

Corpus callosum is appropriately illustrated by MRI and ultrasound.

Nevertheless, a study by Prantl (2009) shows that the US plays a better role in defining genu, rostrum and other body components in comparison to the MRI. On the other side, MRI is more appropriate when utilized to examine splenium and isthmus. Delayed developmental process of splenium and lack of corpus callosum exhibition in fetal development constitutes a thin splenium, appropriately depicted by MRI because it has an advanced contrast resolution.

Interhemispheric cysts have a high connection to the corpus callosum abnormalities. This pathologic condition has a high likelihood of being diagnosed using MRI and US. Moreover, MRI is effective in visualizing polymicrogyria cyst. However, this technique (MRI) has proved to overlook the condition in several instances.

MRI and US imaging modalities have also proved successful in demonstrating cavum septi pellucidi. The two imaging modalities are also able to show septal agenesis in a partial or complete manner. Septo-optic dysplasia is branded by the connection with hypothalamo-pituitary axis of optic nerves hypoplasia pathologic conditions. In this case, the MRI has a high accuracy in comparison to the US based on the understanding that pituitary gland and

optic nerves are inappropriately represented using ultrasound. Nevertheless, the accurateness of MRI in assessment of optic pathways is low. Although pituitary stalk is visible on MR images, there is a high likelihood of overlooking minor pathologic conditions.

Schizencephaly is another pathologic condition effectively diagnosed using ultrasound. This condition is connected to septal agenesis. Using ultrasound, researchers have been successful in diagnosing schizencephaly, in open-lip categories. Jung (2011) adds that the two modalities have emerged successful in analyzing and diagnosing interhemispheric fracture.

Specifically, an experiment by Jung (2011) provided enough findings to prove that ultrasound is more efficient when utilized to diagnose minor categories of holoprosencephaly. Nevertheless, Jung (2011) argument proves that MRI is more effective in this diagnosis in comparison to ultrasound. According to the argument presented by this researcher, effectiveness of MRI over ultrasound is based on the understanding that the fusion between the two hemispheres may be hard to illustrate using ultrasound imaging modality. When it comes to diagnosing various pathologic conditions manifesting in pregnant women, the utilized imaging modality depends on the effectiveness. Various imaging modalities have varying effectiveness when utilized to diagnose pathological conditions in various body parts. For instance, a study by Stojkovic (2012) established that subependymal section is clearly observable on MRI scans as long as they take place between six and seven weeks of pregnancy. The diagnosis shows a periventricular T1 and T2-hyperintensity. It gradually reduces in viscosity and continue to be seen below the frontal horns, being decreasingly noticeable at the eighth months

of pregnancy. However, use of ultrasound proves unsuccessful in visualizing this pathologic condition.

Four categories of lesions have a high likelihood of manifesting when using ultrasound imaging modality, the first category of lesion is subependymal hemorrhage. Use of ultrasound has proved effective in diagnosing this pathological condition. This lesion is situated below the anterior horns, in front of the caudothalamic groove and exhibits a trend similar to the one manifested by postnatal scans. An experiment by Stojkovic (2012) establishes that MRI is also capable of depicting subependymal hemorrhage. The second category of lesion is subependymal tubers. Use of ultrasound has a high likelihood of missing this lesion category. Alternatively, MRI is utilized as an alternative diagnosing imaging modality. Another category referred as subependymal cysts are frequently detected and are likely to be situated opposite the anterior horns or underneath. They are well illustrated using ultrasound that portray characteristic “ thread” sequence in instance of multiple lumps. In most cases, MRI imaging modality is unable to visualize the septa that detach the cysts because of reduced longitudinal resolution. In pathologic disorders (especially in congenital infections), these cysts are likely to be detected opposite the occipital and sequential horns. After using the ultrasound imaging modality to examine these cysts, they can be revealed. Nevertheless, the temporal cysts of far field hemisphere are mainly hard to illustrate. However, use of MRI proves successful in depicting these cysts. The fourth lesion likely to be detected using MRI and ultrasound is subependymal Heterotopia.

Posterior fossa

Posterior fossa is an abnormality that is detectable using ultrasound examination. In the diagnosis process, the sonographers normally examine the vermis while assessing the cerebellar hemispheres and fossa fluid space. Under favorable settings, an organized examination of posterior fossa with midline and axial sagittal views enhances achievement of several diagnoses. After suspecting posterior fossa complication, Jung (2011) insists that it is important to assess the cerebellar hemispheres, ventricle and brainstem. The analysis of these structures proves successful using MRI and ultrasound imaging modalities.

When examining posterior fossa, the Shao (2013) cites several advantages of employing MRI over ultrasound. For instance, Shao (2013) explains that use of ultrasound proves to be more effective in depicting clarity of arachnoid cyst in comparison to the MRI. The variation in cisterna echogenicity is clearly manifested in examinations that incorporate ultrasound. Nevertheless, Shao (2013) proceeds to explain that the two imaging modalities have a similar precision level when utilized in classifying fossa fluids. Based on this perspective, MRI shows several advantages in comparison to ultrasound as an imaging modality for diagnosing various abnormalities among pregnant women.

The first advantage manifests in the process of evaluating vermis. In an appropriate environment, the ultrasound may be more effective in demonstrating normality of vermis. When ultrasound depict abnormality in the vermis shape, MRI is utilized as a more accurate approach of outlining vermis margins while distinguishing vermis from adjacent hemispheres.

When assessing brainstem, ultrasound exhibit another advantage over MRI. According to Prantl (2009), ultrasound is more effective than MRI in outlining brain stem. However, this effectiveness is exhibited when the evaluation of brainstem takes place on sagittal observations. In other conditions, use of ultrasound produces rough outcomes when evaluating the brainstem. An alternative approach of ensuring that the assessment of cerebral pedicles yields accurate results is by utilizing sonographic axial observations. When utilizing MRI to evaluate anteroposterior diameter, advanced results are produced in comparison to cases when ultrasound is utilized. This is based on the perception that MRI has an advanced contrast in comparison to ultrasound.

Methodology

Examining Benefits of Ultrasound

Fetal ultrasound is a direct procedure that has proven to be fast and painless. A characteristic procedural examination mainly lasts between 20 and 30 minutes. In the examination process, a woman usually lies flat while exposing her belly. The first step involved application of jelly solution on her belly to improve the contact level between the skin and ultrasound transducer. The jelly like solution also enhanced improvement of the fetus images. Having a full bladder is also recommended during ultrasound as a way of ensuring that images become clearer.

In order to perform the experiment, radiologists or ultrasound technologists transferred a transducer on the patient's skin. The process results in generation of silent high frequency sound waves across the belly. These

waves are echoed back at various rates and strengths by varying anatomic structures of the patient and unborn baby. These transducer waves are received in the same transducer as the computer restructures them into actual pictures.

In the examination process, recording of the ultrasound movie can take place with an aim of videotaping or freezing the movie. At the same time, recording of the image can be done on a plain piece of paper.

Characteristically, adjusting ultrasound pictures ensures a better focus on the fetus.

Method for MRI Examination

In an experiment to examine the benefits of MRI, Prantl (2009) used ultrasound magnet to capture images. By utilizing breast coil, the researcher collected several systems improved to enhance breast imaging. The next stage involved running Gadolinium through an injection rate of 120 cc per minute. Post processing of the images followed on a particular breast MRI workplace. After six months, the patient had been given two MRI breast checkups. In the initial examination, the experiment assessed cell carcinoma on the left breast. In the second examination, the researcher evaluated the impacts of neoadjuvant handling on the left breast.

Discussion

Benefits of Prenatal Ultrasonography

On the modern healthcare for pregnant women, medical specialists depend strongly on ultrasound with an aim of providing comprehensive images of uterus and fetus. Ultrasound is an appropriate test that this experiment

utilized in order to rule out any emerging worries. Nevertheless, ultrasound depends on the physician operating the process. In the event whereby a proficient general practitioner utilizes an advanced ultrasound apparatus, the assessment can offer comprehensive evidence on the fetus.

The experiment above portrays ultrasound as the most appropriate approach of examining pregnancy abnormality. However, Stojkovic (2012) insists that the imaging modality has to be performed by a skilled physician, in a well-equipped hospital, to emerge successful. In the environment where the risks of chromosomal and hereditary birth defects are high, general practitioners are likely to incorporate additional testing. Common tests are inclusive of chorionic villus sampling and amniocentesis. In amniocentesis, the physician samples the patient's amniotic fluid before birth. On the other side, general practitioners employ chorionic villus sampling that involves examining a specimen of chronic villi and other soft tissues that connect the fetus to the uterus wall. These tests are conducted as complementally measures when the ultrasound experiment fails to produce desired outcomes.

The benefit of ultrasound varies depending on the type. For instance, Jung (2011) explains the existence of trans-abdominal ultrasound and transvaginal ultrasound. The latter is employed in early pregnancy while the former is implemented between five and eight months of pregnancy. In a typical Transvaginal ultrasound process, a medical specialist inserts a probe through the cervix. During the early months of pregnancy, probes are capable of getting near the uterus. Therefore, this approach proves efficient in visualizing the fetus. From this understanding, Jung (2011) concludes that trans-abdominal ultrasound is more effective in comparison to the

transvaginal ultrasound as an imaging modality that helps to uncover anomalies present in pregnancy.

Benefits versus Limitations of MRI

MRI proves to be an effective medical approach of diagnosing and monitoring several complications in pregnant women. The most effective benefit of MRI is in the utilization in breast cancer diagnosis among pregnant and normal adults. The effectiveness of MRI proves effective in diagnosing cancer when the parent is pregnant. When combined with ultrasound imaging modality, the accuracy increases to 100 percent. The case study above uncovers the beneficial impacts of two follow-up MRI tests within a period of five months after the initial tissue removal. MRI breast examination was utilized due to its effectiveness and accuracy of detecting anomalies among women. The case study established that the pregnant women suffer from multifocal illness in the left breast. This results was based on the disparity enriched post processed data.

Through the MRI, general practitioner was able to demonstrate the beneficial impacts prior and after neo-adjuvant chemotherapy to examine reaction to breast tumor. The MRI showed the change in size of the breast tumor. In addition to recording a reduction in the first tumor, the examination showed a reduction in the multifocal lesions number and size in comparison to the previous MRI breast assessment. From this case study, it is apparent that MRI is beneficial in relation to the capability of diagnosing response of tumor after chemotherapy.

Conclusion

The aim of this paper was to examine the benefits of ultrasound over MRI as an imaging modality for assessing fetal brain. The study establishes that the two imaging modalities are complimentary methods; hence, general practitioners using any of the two imaging modalities in diagnosis should be well equipped with benefits and limitations. The adaption of an imaging modality should be based on the maternal body habitus, fetal presentation and detected defects in a patient. The incorporated case study also shows that MRI is beneficial in relation to the capability of diagnosing response of tumor after chemotherapy. From the findings presented in this study, it is apparent that correct prenatal examination procedure is significant in prenatal treatment.

References

- Jung, F. (2011). Image fusion of contrast enhanced ultrasound (CEUS) with computed tomography (CT) or magnetic resonance imaging (MRI) using volume navigation for detection, characterization and planning of therapeutic interventions of liver tumors. *Clinical Hemorheology & Microcirculation* 49 (1): 67-81.
- Prantl, L. (2009). New perfusion imaging of tissue transplants with Contrast Harmonic Ultrasound Imaging (CHI) and Magnetic Resonance Imaging (MRI) in comparison with laser-induced Indocyanine Green (ICG) fluorescence angiography. *Clinical Hemorheology & Microcirculation* 43 (1/2): 19-33.
- Shao, H. (2013). Comparison of the diagnostic efficiency for breast cancer in Chinese women using mammography, ultrasound, MRI, and different

combinations of these imaging modalities. *Journal of X-Ray Science & Technology* 21 (2): 283-292.

Stojkovic, M. (2012). Diagnosing and Staging of Cystic Echinococcosis: How Do CT and MRI Perform in Comparison to Ultrasound? *PLoS Neglected Tropical Diseases* 6 (10): 1-8.

Sung H. (2010). The potential role of dynamic MRI in assessing the effectiveness of high-intensity focused ultrasound ablation of breast cancer. *International Journal of Hyperthermia* 26 (6): 594-603.