

Dynamic Magnetic Resonance: a new technology for fetal Sonography

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Conventional ultrasound imaging is plagued by inherent noise artifacts such as granular appearance, the so-called speckle [1,2]. Caused by 'interference of echoes from the distribution of scatterers in tissue' [2] speckle noise artifacts impair image quality and performance, thus obscure fetal anatomy.

OBJECTIVES

The purpose of the study was to compare a fundamental ultrasound mode with a novel technology for ultrasound imaging enhancement – Dynamic Magnetic Resonance (DynamicMR) and to present the initial experience in the clinical application of this technology in the routine antenatal screening.

METHODS

The comparative analysis of original grey-scale imaging and imaging processed by DynamicMR in the evaluation of the fetal anatomy was carried out. 97 consecutive fetuses between 14 and 38 weeks of gestation were examined by conventional two-dimensional ultrasound with the help of ultrasound system ACCUVIX XQ (MEDISON, Korea) at Russian Medical Academy for Advanced Studies, Diagnostic Center No.4 (Moscow, Russia). By utilizing three-phase filtering process, Dynamic MR virtually suppresses misleading speckle noise artifacts providing magnetic resonance effects on ultrasound images.

RESULTS

In our study this new technology improved fetal organ visualization, including tissue interface, boundaries, fetal bones and small vessels (Figures 1, 2), significantly smoothed grainy depiction of the organ parenchyma (lungs, liver, kidney), providing better contrast resolution and overall clarity (Figures 2, 3).

The edge structures of the entire fetal brain (ventricular system, thalamus, cerebellar fissures) were more well - defined on the processed imaging in comparison with the standard one (Figures 1,4). DynamicMR also improved ultrasound differentiation of endo – and myocardial structures of fetal heart, providing better visualization of the atrioventricular junctions (Figure 5).



FIGURE 1. Left: Original image of the fetus in 16 weeks (sagittal plane). Right: Same image with DynamicMR enhancement applied.

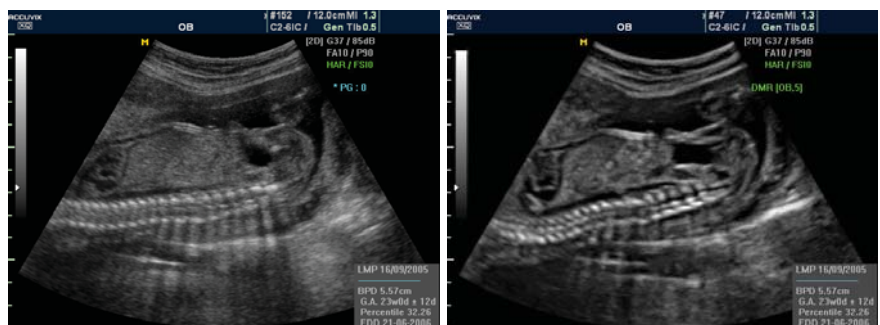


FIGURE 2. Left: Original image of fetal circulation. Right: Same image with DynamicMR enhancement applied.

Thanks to the speckle eliminating process, fetal organs were distinguished and emphasized. This made ultrasound fetal anatomy assessment more accurate.

CONCLUSION

Dynamic Magnetic Resonance (DynamicMR) technology could be regarded as a useful complementary ultrasound method for routine antenatal investigation.

REFERENCES

1. J.A. Zagzebski. Essentials of ultrasound physics. Mosby. 1996
2. F.W. Kremkau. Diagnostic ultrasound. Principles and instruments. Fifth edition. W.B. Saunders Company. 1998.

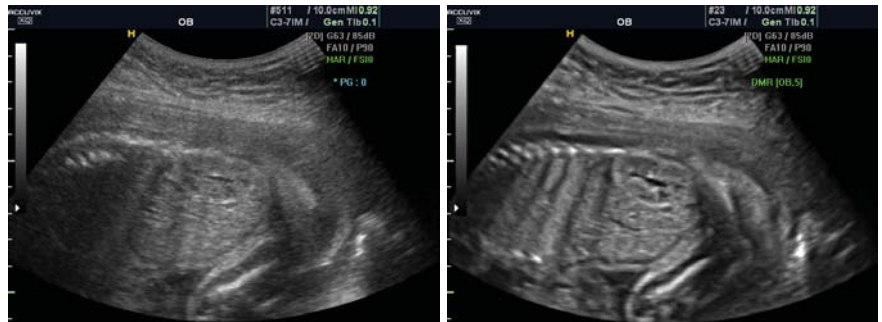


FIGURE 3. Left: Original image of fetal kidney (longitudinal plane). Right: Same image with DynamicMR enhancement applied.



FIGURE 4. Left: Original image of the fetal brain (transverse view). Right: Same image with DynamicMR enhancement applied.



FIGURE 5. Left: Original image of the fetal heart (4-chamber view) and lungs. Right: Same image with DynamicMR enhancement applied.