

Screening for agenesis of the corpus callosum with the use of pattern recognition software

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Objective

To develop software using the standard ultrasound view of the fetal bi-parietal diameter (BPD) in order to identify fetuses at high risk for agenesis of the corpus callosum (ACC).

Methods

Stored ultrasound images of the BPD view from normal fetuses and fetuses with ACC were used to create a pattern recognition software. The image processing was based on searching the segment of the image that is more likely to present a deviation from the normal (region of interest (ROI) rather than processing all the pixels of the image. To that purpose, the midline was selected because it contains the cavum septum pellucidum, which is commonly altered in cases of ACC, and is easily identifiable. The software was trained to analyze the ROI selected by the operator and return a risk estimation for ACC. The abnormal pictures were divided into two groups: the first group was used to construct the software program, and the second group was used to validate its performance. Subsequently, BPD views from normal fetuses were prospectively examined to calculate the false positive rate. All abnormal cases were confirmed by magnetic resonance imaging.

Results

Sixty-one abnormal cases (57 cases with complete ACC and 4 cases with partial ACC) were available for the study. The software was developed using 108 abnormal and 102 normal pictures and was tested in 91 abnormal and 100 normal pictures. The sensitivity of the software was 72%, 87%, and 98% for false positive rates of 2%, 13%, and 53%, respectively (depending on the choice of risk, cut-off, $\geq 30\%$, $\geq 20\%$, and $\geq 10\%$ respectively).

Conclusion

Screening for ACC is possible with pattern recognition software using routinely acquired ultrasound views of the fetal brain.