## 196  Quantification of the fetal cortical sulci along gestation. A novel algorithm for evaluating the fetal brain development

Yuval Ginsberg[1], Hadil Husein[2], Israel Goldstein[1], Dan Adam[2], Zeev Weiner[1]
[1]Rambam Health Care Campus, Haifa, Israel, [2]Department of Biomedical Engineering Technion, Haifa, Israel

**OBJECTIVE:** The pattern of the cortical sulci and its development provides an important information about the fetal brain maturation along the middle to late gestation. In this study, we present a novel simple algorithm which uses sonographic images of the fetal brain to automatically quantify the brain cortex' sulcation.

**STUDY DESIGN:** This is a prospective cross-sectional study. Ultrasound images of mid-sagittal fetal brains were obtained during a routine second and third trimesters scan. A novel image processing algorithm was used in order to measure the total lengths of the fetal brain sulci, at different gestational weeks. The algorithm is a semi-automatic: the user is required to choose the image he wants to process, and grossly mark the region of interest (ROI) in the ultrasound image. Then, the algorithm automatically extracts the sulci by using image processing tools. The user may interactively modify the results, by removing curves that were detected as sulci but are not. (such misdetection of sulci is caused by the noise in the US images). Furthermore, the user may also interactively connect between detected sulci which were not identified as connected, due to low grey levels of the image. The algorithm uses the imaging system scale, superimposed on each image (e.g. 0.5 centimeter interval between scale lines) to calculate the number of pixels per meter, to provide the total length of the sulci in centimeters instead of pixels.

**RESULTS:** Overall, 74 fetuses were scanned between 27 and 35 weeks of gestation. On the sagittal plane, the sulci were visualized, as a hyper-echogenic lines, below the subarachnoid space, and above the corpus callosum. A linear regression line of the sulci was observed across gestational age (GA), and a first-degree correlation was found between GA and total lengths of the sulci, ($r^2$=0.928; p=0.000534<0.001).

**CONCLUSION:** In our current study, we have established a novel algorithm for the quantification of the fetal brain sulcation. This simple automated technic might improve the sonographic evaluation of the fetal brain.
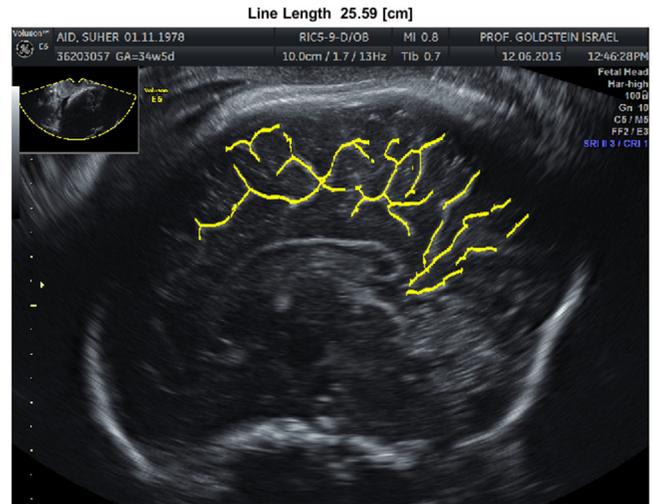




## 197  Indications for invasive prenatal testing before and after implementation of non-invasive prenatal screening

Lisa Gill, Tracy L. Prosen
University of Minnesota, Minneapolis, MN

**OBJECTIVE:** To evaluate the differences in number, type, and indication of invasive prenatal genetic testing in a single center prior to and following the introduction of non-invasive prenatal screening (NIPS).

**STUDY DESIGN:** All genetic testing procedures between January 1, 2007 and December 31, 2015 were collected from a single center. Indication for genetic testing was determined as advanced maternal age (AMA), abnormal ultrasound findings, abnormal genetic screening, history of a parental chromosomal abnormality, history of prior aneuploid pregnancy, and risk for Mendelian disorders. NIPS was introduced at the center on February 1, 2012. Procedures prior to and after this date were compared. Fisher exact test was used to compare indications for testing prior to NIPS and after NIPS.

**RESULTS:** A total of 2066 patients had invasive genetic testing in the study period. Of these, 43 were excluded as genetic testing was incidental to procedures performed for non-genetic indications, giving a total of 2023 patients considered for analysis. While the pre-NIPS group was longer (61 months) than the post-NIPS group (46 months) the number of patients seen was similar (49,352 vs 49,016). 1415 patients had invasive testing prior to introduction of NIPS, (489 CVS, 926 amniocentesis) and 608 patients had invasive testing following introduction of NIPS, (327 CVS, 281 amniocentesis). Average procedures per month prior to NIPS decreased from 23 to 13 per month despite an increase in patient volume per month in the unit. CVS numbers remained similar (8/month vs 7/month), however amniocentesis numbers decreased (15/month vs 7/month). Procedures with the indication of AMA (p=0.0001), abnormal genetic screening (p=0.0001), and abnormal ultrasound (p=0.002) were significantly fewer after introduction of NIPS, while procedures with the indications of prior aneuploid pregnancy (p=0.2), parental chromosomal abnormality (p=0.5), and risk for single gene disorders was not significantly changed (p=0.4).

**CONCLUSION:** The introduction of NIPS into clinical practice significantly lowered the number of invasive genetic tests at this single center, with decreases in amniocentesis but not CVS. Indications