208 A prospective randomized pilot study of handheld ultrasound assessment of abdominal circumference (HHUS/AC) to detect growth abnormalities

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OBJECTIVE: Fetal growth abnormalities are some of the most common and complex problems in obstetrics. Traditional screening for growth abnormalitues with fundal height (FH) measurement has demonstrated mixed results. Our objective was to determine the feasibility of using HHUS/AC to identify growth abnormalities in a low risk setting and obtain pilot data to power future studies.

STUDY DESIGN: A prospective randomized pilot study was performed comparing FH to HHUS/AC in screening for growth abnormalities. Candidates were enrolled prior by 32 weeks from low risk obstetric clinics at the Medical University of South Carolina. Screening was completed at each visit from 32-37 weeks gestation. Formal growth evaluation was completed when FH differed from gestational age by >3 cm or when the HHUS/AC was <10% or >90%. Bi-variable comparisons were completed using chi-square and Student's t-tests. Sensitivity, specificity, PPV, and NPV were calculated with 95% confidence intervals to detect birth weight abnormalities. Finally, a sample size for future studies was calculated.

RESULTS: 103 patients were enrolled with equal allocation between the control (FH) group and study (HHUS) group with one patient was excluded due to delivery <32 weeks. There was no significant difference between groups with regard to age, race, BMI, HTN, DM/GDM, smoking, and drug use. HHUS/AC measurements were obtained in 100% of patients with an average time of 2.47 minutes. 22% of patients in the FH group were referred for formal growth versus 36% in the HHUS group. There was a trend toward improved sensitivity of HHUS/AC for detection of IUGR (Sn HHUS AC 50% vs. Sn FH 14.2%, p=0.16) while FH appeared to be superior for detection of LGA (Sn HHUS AC 20% vs. Sn FH 50%, p=0.29).

CONCLUSION: HHUS/AC can be reliably obtained in low risk patients during a routine OB visit. HHUS/AC may be more relevant in the detection of IUGR as opposed to LGA. An appropriately powered RCT comparing HHUS/AC and FH for detection of IUGR would require 72 per group.

Table 1: FH vs HHUS performance statistics

	Sensitivity	Specificity	PPV	NPV	% Referred for US
FH - All	30.7%	81.5%	36.4%	77.5%	18%
HHUS - All	36.6%	65.0%	22.2%	78.8%	32%
FH - IUGR	14.2%	95%	33%	87.5%	6%
HHUS - IUGR	50%	76%	28.5%	94%	20%
FH - LGA	50%	93%	50%	93%	12%
HHUS - LGA	20%	88%	16%	91%	12%

209 Validation of the Placenta Accreta Index (PAI): Improving the antenatal diagnosis of the morbidly adherent placenta

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OBJECTIVE: Abnormal placental invasion (API) is a major contributor of maternal morbidity and mortality in the modern era of obstetrics. The Placental Accreta Index (PAI) was recently proposed to predict individual risk for morbidly adherent placenta using 2-D and color Doppler sonographic exam. Our objective was to validate the PAI index at our institution and determine if it has a higher prediction than our current system.

STUDY DESIGN: A retrospective study was performed of patients that had sonographic diagnosis of placenta previa at our institution from 2005 to 2015. The sonographic images of these cases were independently reviewed by three Maternal-Fetal Medicine (MFM) physicians using the PAI index, who were blinded to the sonographic and final diagnoses. We used the reported PAI index that provides a score based on history of prior cesarean delivery (s), placental location, characteristics of placental venous lakes, lower uterine segment thickness, and the presence or absence of bridging vessels. The PAI score was used to determine the sonographic diagnosis of API. The diagnostic accuracy, sensitivity, specificity, positive and predictive values (PPV and NPV), and receiver operator characteristic (ROC) curve were calculated pre and post PAI scale implementation.

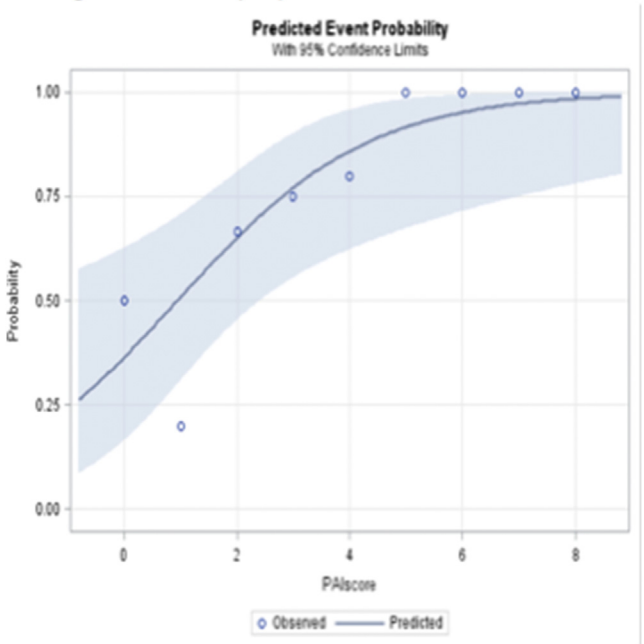
RESULTS: A total of 66 cases were identified. Prior to the implementation of the PAI index, ultrasound diagnostic accuracy of API was 66.6%. The PAI evaluation system increased our diagnostic accuracy to 80.3%. Implementation of the PAI scoring system significantly improved the sensitivity of ultrasound diagnosis (34% to 60%, p=0.005). Specificity, PPV, and NPV were also higher using the PAI index (Table 1). Area under the ROC curve (AUC) of PAI index to predict API was 0.774 in cases with no previous cesarean and 0.794 with at least on prior cesarean delivery, which were lower than previously reported (0.87). A PAI score of >4 predicted 100% of abnormal placenta invasion in patients with at least 1 prior CD.

CONCLUSION: Implementation of the systematic PAI scoring system significantly improved the antenatal detection of morbidly adherent placenta compared to prior standard interpretation. The probability of invasion parallels the PAI score, with a score >4 predicting almost certain morbid invasion. Our prediction with PAI score was lower than previously published.

Table 1: Ultrasound performance statistics for diagnosis of placental invasion

	Pre-PAI Implementation	Post PAI Implementation (All)	Post PAI Implementation (1+ prior CD)
Sensitivity	34%	52%	60%
Specificity	92%	100%	100%
PPV	77%	100%	100%
NPV	64%	73%	55%
+ LR	4.25	NC	NC
- LR	0.72	0.48	0.4

Figure 1: Probability of placental invasion based on PAI score



210 Fetal growth patterns in hypertensive disorders of pregnancy: the NICHD fetal growth studies

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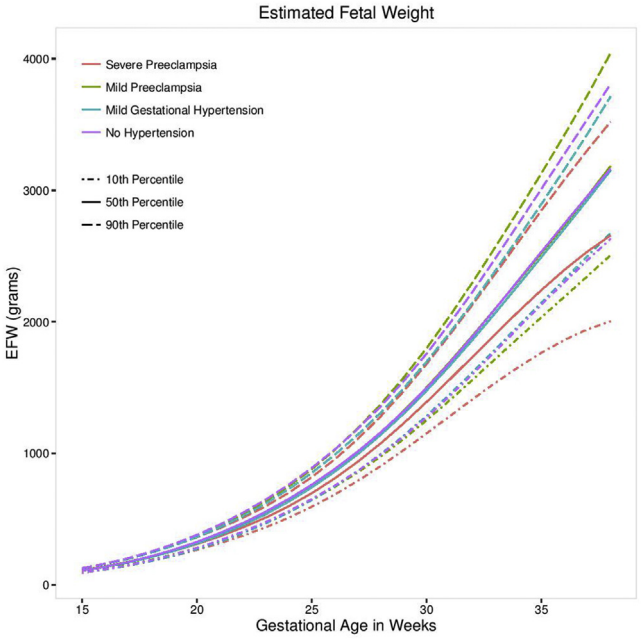
OBJECTIVE: We lack an understanding of longitudinal patterns of fetal growth in pregnancies that develop hypertensive disease. Our objective was to compare longitudinal fetal growth trajectories between normotensive pregnancies and those complicated by pregnancy-induced hypertensive disorders.

STUDY DESIGN: This is a secondary analysis of a multicenter longitudinal study of fetal growth. Dating was assured by ultrasound between 8w0d and 13w6d and women had six targeted ultrasounds across gestation. Women were grouped as mild or severe gestational hypertension (mild-GHTN or severe-GHTN), mild or severe preeclampsia (mild-PE or severe-PE), and no-hypertension (no-HTN) based on the discharge diagnosis. Growth curves for estimated fetal weight (EFW) and individual biometric parameters were created using linear mixed models with cubic splines. Global and weekly pair-wise comparisons were performed between groups to analyze differences adjusting for confounding variables.

RESULTS: Of the 2,584 pregnancies analyzed, 2402 (92.9%) were normotensive, 65 (2.5%) mild-GHTN, 58 (2.2%) mild-PE, and 34 (1.3%) severe-PE. Seven women with severe-GHTN were excluded due to the small number. Compared to other groups, EFW was reduced in the severe-PE group distinguishing itself from 21 weeks onward (weekly pairwise P values $<.05$; Figure). Significant reductions were also noted in the abdominal circumference growth between no-HTN and severe-PE groups from 21 to 38 weeks' gestation (weekly pairwise P values $<.05$), head circumference from 24 to 32 weeks, and some scattered differences in other parameters. EFW and individual biometrics had scattered differences among mild-GHTN, mild-PE, and normotensive pregnancies, but the magnitude of these differences was comparatively small.

CONCLUSION: Among hypertensive disorders of pregnancy, only pregnancies destined to develop severe-PE had a significant and consistent adverse effect on fetal growth. Severe-PE is associated with an early- onset fetal growth restriction.



211 Early fetal growth abnormalities and development of severe preeclampsia: the NICHD fetal growth studies

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OBJECTIVE: Preeclampsia is hypothesized to be associated with abnormal vascular development of the placenta resulting in fetal growth abnormalities. Our objective was to determine whether abnormal fetal growth in the first or second trimester was associated with the later onset of severe preeclampsia.

STUDY DESIGN: In a secondary analysis of a multicenter longitudinal study of fetal growth, women had six serial sonographic exams across gestation. Pregnancies were classified as severe preeclampsia (severe-PE) and normotensive based on discharge diagnosis. Crown to rump length (CRL) measurements (mean ± SEM) for the severe-PE group were adjusted for gestational age between 8w0d and 13w6d and compared to the normotensive group using non-parametric tests. Estimated fetal weight (EFW), biparietal diameter (BPD), head circumference, abdominal circumference, and femur length (mean ± SEM) for the severe-PE group between 15-24 weeks' gestation were also compared in a similar fashion. Receiver operating characteristic (ROC) curves were created whenever statistical difference in CRL and biometric parameters was noted between the groups.

RESULTS: Of 2,436 pregnancies analyzed, 2402 (98.6%) were normotensive and 34 (1.4%) had severe-PE. There were no differences in CRL measurements between the groups (p=0.29). EFW between 15 and 20 weeks of gestation were significantly lower in