

IMAGING

Accuracy of ultrasound for the prediction of placenta accreta

Zachary S. Bowman, MD, PhD; Alexandra G. Eller, MD; Anne M. Kennedy, MB BCh, BAO; Douglas S. Richards, MD; Thomas C. Winter III, MD, MA; Paula J. Woodward, MD; Robert M. Silver, MD

OBJECTIVE: Ultrasound has been reported to be greater than 90% sensitive for the diagnosis of accreta. Prior studies may be subject to bias because of single expert observers, suspicion for accreta, and knowledge of risk factors. We aimed to assess the accuracy of ultrasound for the prediction of accreta.

STUDY DESIGN: Patients with accreta at a single academic center were matched to patients with placenta previa, but no accreta, by year of delivery. Ultrasound studies with views of the placenta were collected, deidentified, blinded to clinical history, and placed in random sequence. Six investigators prospectively interpreted each study for the presence of accreta and findings reported to be associated with its diagnosis. Sensitivity, specificity, positive predictive, negative predictive value, and accuracy were calculated. Characteristics of accurate findings were compared using univariate and multivariate analyses.

RESULTS: Six investigators examined 229 ultrasound studies from 55 patients with accreta and 56 controls for 1374 independent

observations. 1205/1374 (87.7% overall, 90% controls, 84.9% cases) studies were given a diagnosis. There were 371 (27.0%) true positives; 81 (5.9%) false positives; 533 (38.8%) true negatives, 220 (16.0%) false negatives, and 169 (12.3%) with uncertain diagnosis. Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy were 53.5%, 88.0%, 82.1%, 64.8%, and 64.8%, respectively. In multivariate analysis, true positives were more likely to have placental lacunae (odds ratio [OR], 1.5; 95% confidence interval [CI], 1.4–1.6), loss of retroplacental clear space (OR, 2.4; 95% CI, 1.1–4.9), or abnormalities on color Doppler (OR, 2.1; 95% CI, 1.8–2.4).

CONCLUSION: Ultrasound for the prediction of placenta accreta may not be as sensitive as previously described.

Key words: placenta accreta, prenatal diagnosis, sensitivity and specificity, ultrasound

Cite this article as: Bowman ZS, Eller AG, Kennedy AM, et al. Accuracy of ultrasound for the prediction of placenta accreta. *Am J Obstet Gynecol* 2014;211:177.e1-7.

Placenta accreta is defined as an abnormal adherence of placental villi to underlying myometrium with an absence of decidua basalis. Failure to anticipate placenta accreta and prepare for its appropriate management can lead to emergency hysterectomy with profuse, life-threatening hemorrhage,^{1,2} disseminated coagulopathy, renal failure, acute respiratory distress, or even death.³ Additional surgical complications include cystotomy, ureteral injury,

★ EDITORS' CHOICE ★

infection, venous thromboembolism or prolonged hospitalization.⁴⁻⁶ Accurate antenatal diagnosis of placenta accreta can allow arrangements to be made for a planned delivery at a tertiary care center utilizing a multidisciplinary approach, which has been shown to significantly reduce maternal morbidity.⁵⁻⁷

As the incidence of placenta accreta increases concurrently with an increased

incidence of cesarean delivery,^{1,4,8,9} patients and providers are more frequently confronted with difficult decisions such as whether to plan for a scheduled hysterectomy or to transfer care to a tertiary care center. With its implications for surgical morbidity and future fertility, this is not a decision taken lightly.

Placenta previa and history of prior cesarean delivery remain the most important predictors of placenta accreta.⁴ In addition to clinical risk factors, ultrasound is often used antenatally as an adjunct to clinical history to modify risk estimation for placenta accreta. The accuracy of ultrasound for the prediction of placenta accreta is generally reported to be good with sensitivities ranging from 77–97%.¹⁰⁻¹⁵ However, prior studies on the accuracy of ultrasound for the prediction of accreta may be subject to bias because of single expert observers, suspicion for accreta, and knowledge of risk factors. Our objective was to assess the accuracy of ultrasound for the prediction of placenta accreta using multiple observers blinded to clinical status.

From the Departments of Obstetrics and Gynecology (Drs Bowman, Eller, Richards, and Silver) and Radiology (Drs Kennedy, Winter, and Woodward), University of Utah Health Sciences Center, and the Department of Obstetrics and Gynecology, Intermountain Healthcare (Drs Bowman, Eller, Richards, and Silver), Salt Lake City, UT.

Received Dec. 17, 2013; revised Jan. 30, 2014; accepted March 10, 2014.

The authors report no conflict of interest.

University of Utah Center for Clinical and Translational Sciences grant support (CTSA 5UL1RR025764-02) enabled the use of Research Electronic Data Capture (REDCap) for this project.

Presented, in part, in poster format at the 34th annual meeting of the Society for Maternal-Fetal Medicine, New Orleans, LA, Feb. 3-8, 2014.

Reprints not available from the authors.

0002-9378/free • © 2014 Mosby, Inc. All rights reserved. • <http://dx.doi.org/10.1016/j.ajog.2014.03.029>

➤ See related editorial, page 87

TABLE 1
Patient characteristics

Characteristic	Accreta (Cases)	Controls	P value
Maternal age, y (mean $\pm$ SD)	32.4 $\pm$ 5.2	31.3 $\pm$ 6.9	.36 ^a
Body mass index, kg/m ² (mean $\pm$ SD)	29.0 $\pm$ 9.4	31.9 $\pm$ 6.9	.15 ^a
Gravidity (median, range)	5 (2–18)	4 (1–14)	.0047 ^b
Parity (median, range)	3 (1–7)	2 (0–10)	.0090 ^b
Cesarean delivery (n, %)			< .001 ^c
0	1 (1.8)	16 (28.6)	
1	17 (30.9)	25 (44.6)	
2	16 (29.1)	9 (16.1)	
3+	21 (38.2)	6 (10.7)	
Delivery gestational age, wk (mean $\pm$ SD)	33.8 $\pm$ 3.0	34.9 $\pm$ 4.0	.12 ^a
Gestational age at study, wk (median, interquartile range)	29.2 (25.1–32.4)	29.3 (23.9–33.6)	.11 ^b

^a Students *t* test; ^b Wilcoxon-Mann-Whitney test; ^c Fisher exact test.Bowman. Accuracy of ultrasound for the prediction of placenta accreta. *Am J Obstet Gynecol* 2014.

MATERIALS AND METHODS

Patients who delivered at the University of Utah between 2000 and 2012 with documentation of a clinical or histopathologic diagnosis of placenta accreta^{5,7,16} were identified and matched to patients with placenta previa but no accreta by year of delivery. Histopathologic diagnosis of accreta was confirmed by documentation of placental invasion into the myometrium, and clinical diagnosis of accreta was confirmed by documentation

of abnormal adherence of the placenta or evidence of gross placental invasion at the time of surgery. Patients were included if they had ultrasound images of the placenta available at a gestational age of greater than or equal to 16 weeks. For each patient, every image of the placenta was collected, de-identified, and blinded to clinical history. Images from each study were then placed in random sequence using the Microsoft Excel random number generator.

TABLE 2
Diagnostic performance characteristics of ultrasound for the diagnosis of placenta accreta

Characteristic	Excluding missing/uncertain diagnoses	Missing/uncertain diagnoses assigned as no accreta
Sensitivity	62.8 (58.7–66.7)	53.3 (49.5–57.1)
Specificity	86.8 (83.9–89.4)	88.1 (85.4–90.4)
PPV	82.1 (78.7–85.0)	82.1 (78.8–85.4)
NPV	70.8 (68.5–73.0)	64.8 (62.9–66.7)
Accuracy	75.0 (72.5–77.4)	65.8 (63.2–68.3)

Data are % (95% confidence interval).

NPV, negative predictive value; PPV, positive predictive value.

Bowman. Accuracy of ultrasound for the prediction of placenta accreta. *Am J Obstet Gynecol* 2014.

Six investigators consisting of 3 experienced obstetric radiologists (A.M.K., T.C.W., and P.J.W.) and 3 maternal-fetal medicine physicians (A.J.E., D.S.R., and R.M.S.) prospectively reviewed and interpreted each ultrasound study. All 3 radiologists are fellowship trained in abdominal imaging and have more than 10 years' experience in obstetric ultrasound, including evaluation of accreta. Similarly, all 3 maternal-fetal medicine specialists are fellowship trained and have a minimum of 8 years of experience in diagnosing placenta accreta (>20 years for 2 of the 3 physicians). Investigators were asked to score each imaging study for the presence of accreta ("yes," "no," or "unable to determine") and indicate the presence or absence of specific findings that have been reported to be associated with its diagnosis. These findings included the following: number of lacunae,^{17–20} loss of retroplacental clear space,^{13,17,18,20,21} loss of visualization of the myometrium,²⁰ and bladder wall irregularity.²⁰ If color Doppler was used, investigators further identified the presence or absence of the following: subplacental vascularity,^{10,11,22} vessels bridging from the placenta to the uterine margin,^{10,13,20} gaps in myometrial blood flow,^{10,20} vessels crossing interface disruption sites,¹³ or turbulent lacunae.^{10,23} If a diagnosis was made, investigator confidence for each imaging study was scored on a scale of 0 (none) to 10 (certain), and image quality was scored on a scale from 1 (very poor) to 10 (best).

Study data were collected and managed using REDCap electronic data capture tools hosted at the University of Utah.²⁴ REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads to common statistical packages; and (4) procedures for importing data from external sources.

Continuous variables were analyzed with the Student *t* test. Categorical

Download English Version:

<https://daneshyari.com/en/article/3432977>

Download Persian Version:

<https://daneshyari.com/article/3432977>

[Daneshyari.com](https://daneshyari.com)