

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/51217312>

# Can Ultrasonography of the Placenta Previa Predict Antenatal Bleeding?

Article in *Journal of Clinical Ultrasound* · October 2011

DOI: 10.1002/jcu.20849 · Source: PubMed

---

CITATIONS

10

---

READS

39

9 authors, including:



[Junichi Hasegawa](#)

St. Marianna University School of Medicine

135 PUBLICATIONS 623 CITATIONS

SEE PROFILE



[Ryu Matsuoka](#)

Showa University

73 PUBLICATIONS 862 CITATIONS

SEE PROFILE



[Kiyotake Ichizuka](#)

Showa University

109 PUBLICATIONS 787 CITATIONS

SEE PROFILE



[Akihiko Sekizawa](#)

Showa University

239 PUBLICATIONS 3,317 CITATIONS

SEE PROFILE

# Can Ultrasonography of the Placenta Previa Predict Antenatal Bleeding?

Junichi Hasegawa, MD, Miwa Higashi, MD, Shoko Takahashi, MD, Takashi Mimura, MD, Masamitsu Nakamura, MD, Ryu Matsuoka, MD, Kiyotake Ichizuka, MD, Akihiko Sekizawa, MD, Takashi Okai, MD

Department of Obstetrics and Gynecology, Showa University School of Medicine, Tokyo, Japan

Received 4 August 2010; accepted 15 April 2011

**ABSTRACT:** *Purpose.* To evaluate the abnormal sonographic (US) findings in patients with placenta previa and bleeding.

*Methods.* A total of 182 cases of singleton pregnancies with placenta previa were reviewed. The US findings including the type of placenta previa, placental location, presence of placenta lacunae, lack of clear zone, sinus venosus at the margin of the placenta, velamentous cord insertion, sponge-like echo in the cervix and cervical length were evaluated in relation to episodes of bleeding that required in-patient treatment during pregnancy and/or emergency cesarean section.

*Results.* Episodes of antenatal bleeding occurred in 102/182 (56%) patients with placenta previa. An emergency cesarean section was performed in 66 (64.7%) of these 102 patients. In the 80 patients without episodes of antenatal bleeding, an emergency cesarean section was performed in only 1 (1.3%). Detection of US findings just prior to cesarean section was not associated with the need for emergency cesarean section due to uncontrollable bleeding from the placenta previa. Frequencies of each US finding at 20 weeks of gestation were not different between the patients who underwent emergency cesarean sections and the others. Frequency of marginal sinus was slightly higher in cases with bleeding episode (16% versus 0%,  $p < 0.05$ ), but the other US findings were not associated with the occurrence of bleeding episodes during pregnancy.

*Conclusions.* No US finding could predict bleeding episodes and the eventual need for an emergency cesarean section. The obstetrician should be aware that sudden bleeding during pregnancy may occur in patients with placenta previa, even in the absence of any other US findings. © 2011 Wiley Periodicals, Inc. *J Clin Ultrasound* 39:458–462, 2011; Published online

in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/jcu.20849

**Keywords:** placenta previa; cesarean section; bleeding; obstetrics; cervical length

## INTRODUCTION

Sudden active bleeding from placenta previa during pregnancy increases the risk of maternal and neonatal morbidity and mortality. Unfortunately, to our knowledge, there are only three previous reports regarding antenatal prediction of such bleeding in patients with placenta previa based on the sonographic (US) appearance of the placenta. A low-lying placenta with a thick edge,<sup>1</sup> a shortening of the cervix,<sup>2</sup> and an echo-free space in the marginal areas of the placenta overlying the internal os were reported as important US findings useful for the prediction of antenatal bleeding in the placenta previa.<sup>3</sup> The ability to predict such sudden bleeding could improve the management of cases with placenta previa and determine the necessity for admission to the hospital, preservation of self blood, and timing of a cesarean section.

The purpose of the present study was to clarify whether specific US appearances of placenta previa can predict bleeding during pregnancy and emergency cesarean section.

## MATERIALS AND METHODS

The charts of 182 patients with a singleton pregnancy and placenta previa who underwent delivery via cesarean section between 2000 and 2009 at our university hospital were retrospectively reviewed. The following US findings were

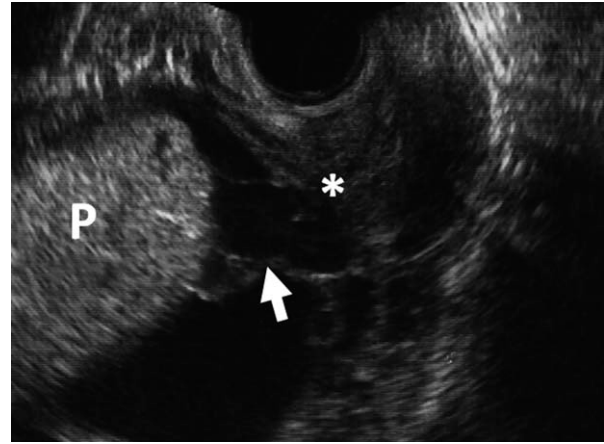
Correspondence to: J. Hasegawa



**FIGURE 1.** Sponge-like findings of the uterine cervix. Sponge-like finding (arrow) is defined when five or more hypo-echoic areas larger than 5 mm in diameter are observed. P, placenta; asterisk, internal os.

evaluated: length of the placenta covered with internal os (complete placenta previa), location of placenta on the anterior wall, location of placenta on a previous cesarean section scar, presence of placental lacunae (defined as irregular hypo-echoic areas in the placental parenchyma larger than  $1 \times 1$  cm), lack of clear zone which is visualized as low echoic line between the myometrium and the placenta, presence of a sponge-like appearance of the cervix with five or more hypo-echoic areas larger than 5 mm in diameter (Figure 1), presence of an expanded marginal sinus with a hypoechoic space showing flow at the placental margin (Figure 2), abnormal cord insertion (velamentous or marginal cord insertion), and a short cervical length.

The diagnosis of placenta previa was made by experienced obstetricians based on transvaginal US findings showing the internal os covered by the placental tissue after 20 weeks. These findings were routinely recorded in the medical records. When these findings were not found in the chart, then the sonograms obtained during US and stored in the patient's medical record were reviewed. Placenta previas included complete, partial, and marginal placenta previas just prior to cesarean section. Cases with low-lying placentas were excluded. A complete placenta previa was defined as a placenta covering the os by more than 2 cm at delivery. The cases of placenta previa with bleeding were monitored by transabdominal and transvaginal US usually every week. Even in the absence of any bleeding, US examination was performed within a week before cesarean section in all cases. Therefore, gestational ages at the time of US were almost the same as at the times of cesarean section.



**FIGURE 2.** Expanded marginal sinus on the internal os. An expanded marginal sinus (arrow) is defined when a space of low echogenicity showing flow at the placental margin is observed. P, placenta; asterisk, internal os.

Elective cesarean sections were usually planned between 36 and 37 weeks of gestation. Emergency cesarean sections were performed when uncontrollable bleeding or uterine contractions occurred. Cases with an episode of antenatal bleeding were defined as cases that had bleeding from the placenta, excluding bleeding from erosion of the portio vaginalis or cervical polyp, and which required admission for treatment of bleeding after 20 weeks of gestation regardless of the amount of bleeding.

The US examinations were performed using a Sonovista scanner (Siemens Ultrasound, Mountain View, CA) equipped with a 7.5-MHz convex endovaginal transducer, Prosound SSD-3500 and 5000 scanners (Aloka, Tokyo, Japan) equipped with a 3.5-MHz convex transabdominal transducer, and with a 7.5-MHz convex endovaginal transducer, alpha 10 (Aloka) equipped with a 2–10-MHz convex transabdominal transducer and with a 7.5-MHz convex endovaginal transducer, and Voluson 730 and E8 (GE Healthcare, Milwaukee, WI) equipped with a transabdominal 4–8 MHz convex probe.

The data were entered into a statistical software package (Statistical Package for Social Science (SPSS), Windows version 16.0J; Chicago, IL). Categorical variables were reported as percentages and compared using the Fisher's exact test. Continuous variables were compared using the Mann-Whitney *U* test. Statistical significance was defined as a *p* value of less than 0.05.

## RESULTS

Episodes of antenatal bleeding occurred in 102/182 (56%) patients with placenta previa. An

**TABLE 1**  
**Maternal and Neonatal Demographics in Patients who Underwent an Emergency Cesarean Section due to Uncontrollable Bleeding From the Placenta Previa and in Patients who Did Not**

Variables	Patients who Required Emergency CS	Other Patients	
	due to Bleeding (n = 67) (37%)	(n = 115) (63%)	
Age (yr)	33 (23–41)	34 (24–43)	<i>p</i> < 0.05
Para	1 (0–3)	0 (0–2)	<i>p</i> < 0.05
Previous cesarean	0 (0–2)	0 (0–1)	ns
Previous spontaneous abortion	0 (0–2)	0 (0–2)	ns
Previous artificial abortion	0 (0–2)	0 (0–1)	ns
Gestational age at delivery (wk)	34 (22–37)	37 (35–37)	<i>p</i> < 0.05
Amount of bleeding during CS (ml)	1883 ± 1318	2054 ± 1552	ns
Adherence of the placenta (n)	3 (4.5%)	7 (6.1%)	ns
Neonatal birth weight (g)	2066 ± 501	2697 ± 354	<i>p</i> < 0.05
Apgar 1 min	6 (1–9)	8 (1–9)	<i>p</i> < 0.05
Apgar 5 min	8 (3–10)	9 (2–10)	<i>p</i> < 0.05

Values indicate the mean (range), n (%), or mean ± standard deviation. The statistical analyses were performed by a Mann-Whitney *U* test or Fisher's exact test.

Abbreviations: CS, cesarean section; ns, not statistically significant.

**TABLE 2**  
**Comparison of US Findings in Patients who Required an Emergency Cesarean Section due to Uncontrollable Antenatal Bleeding and in Patients who Did Not**

Ultrasonographic Findings prior to CS	Patients who Required Emergency CS	Other Patients	
	(n = 67)	(n = 115)	
Length of placenta covering the os (mm)	32 ± 22	30 ± 28	ns
Complete placenta previa	73.1% (49/67)	59.1% (68/115)	ns
Placenta on the anterior wall	17.9% (12/67)	10.4% (12/115)	ns
Placenta on the previous CS scar	10.4% (7/67)	4.3% (5/115)	ns
Presence of placental lacunae	20.9% (14/67)	20.9% (24/115)	ns
Lack of clear zone	4.5% (3/67)	7.0% (8/115)	ns
Sponge-like appearance	26.9% (18/67)	28.7% (33/115)	ns
Marginal sinus	16.4% (11/67)	18.3% (21/115)	ns
Abnormal cord insertion	11.9% (8/67)	13.9% (16/115)	ns
Cervical length (mm)	31 ± 8	31 ± 7	ns
Short cervical length (<25 mm)	18.2% (12/66)	14.6% (15/103)	ns

The statistical analyses were performed by the Mann-Whitney *U* or Fisher's exact test. Abbreviations: CS, cesarean section; ns, not statistically significant.

emergency cesarean section was performed in 66 (64.7%) of these 102 patients. In the 80 patients without episodes of antenatal bleeding, an emergency cesarean section was performed in only one patient (1.3%). Thus, emergency cesarean sections due to uncontrollable bleeding were performed in 67/182 (37%) of patients with placenta previa.

Table 1 shows the maternal and neonatal demographics in patients who underwent an emergency cesarean section due to uncontrollable bleeding from the placenta previa and in those who did not. The gestational age at the time of delivery, the neonatal birth weight, and the Apgar scores were significantly lower in patients who required an emergency cesarean section than in those who did not.

Table 2 correlates each US parameter with the subsequent need for an emergency cesarean sec-

tion for uncontrollable bleeding from the placenta previa. For each US finding there was no statistically significant difference between patients who required an emergency cesarean section for bleeding and those who did not bleed.

Since some patients were referred to our hospital after 20 weeks' gestation, the US findings of the placenta previa at 20 weeks of gestation were available only in 77 cases. Table 3 compares the US findings of the placenta previa noted at 20 weeks of gestation in women who eventually had bleeding episodes versus those who did not and in women who eventually required an emergency cesarean section due to uncontrollable bleeding from the placenta previa versus those who did not. The only statistically significant difference involved the presence of a marginal sinus at 20 weeks' gestation, which was observed in 16% of cases with bleeding episode during their

## BLEEDING OF PLACENTA PREVIA DURING PREGNANCY

**TABLE 3**

**Comparison of US Findings of Placenta Previa Noted at 20 weeks of Gestation in Women who Eventually Bled versus Those who Did Not and in Women who Eventually Required an Emergency Cesarean Section due to Uncontrollable Bleeding From the Placenta Previa versus Those who Did Not**

	Bleeding Episode			Emergency CS due to Uncontrollable Bleeding		
	Present (n = 50)	Absent (n = 27)		Performed (n = 33)	Other Women (n = 44)	
Complete placenta previa	80.0% (40)	73.0% (19)	ns	84.8% (28)	72.1% (31)	ns
Placenta on the anterior wall	12.0% (6)	7.4% (2)	ns	15.2% (5)	6.8% (3)	ns
Placenta on the previous CS scar	8.0% (4)	0% (0)	ns	9.1% (3)	2.3% (1)	ns
Placenta lacunae	10.0% (5)	14.8% (4)	ns	18.2% (6)	6.8% (3)	ns
Lack of clear zone	8.0% (4)	0% (0)	ns	9.1% (3)	2.3% (1)	ns
Sponge-like findings	8.0% (4)	11.1% (3)	ns	6.1% (2)	11.4% (5)	ns
Marginal sinus	<b>16% (8)</b>	<b>0% (0)</b>	$p < 0.05$	18.2% (6)	4.5% (2)	ns
Abnormal cord insertion	22.0% (11)	22.2% (6)	ns	21.2% (7)	22.7% (10)	ns

The statistical analyses were performed by Fisher's exact test. Abbreviations: CS, cesarean section; ns, not statistically significant.

pregnancies but in none of all cases without bleeding episode ( $p < 0.05$ ).

### DISCUSSION

Saitoh et al reported that the risk of massive antenatal hemorrhage was higher in cases of placenta previa with an echo-free space (similar to the sinus venosus defined in this study) in the placental edge overlying the internal os.<sup>3</sup> They suggested that the echo-free space in the marginal areas of the placenta (an area associated with turbulent blood flow) was either placental sinus or varices that developed in the decidual tissue. Although the pathophysiological changes associated with marginal sinus have not been well established, we hypothesized that an expanded marginal sinus indicates the retention of maternal blood flow in the intervillous space and decidual tissue, which may collapse occasionally due to uterine contraction, resulting in a large-volume hemorrhage during pregnancy.

Sponge-like appearance has been reported as a US finding associated with massive bleeding during cesarean section in patients with placenta previa.<sup>3,4</sup> Hurton et al<sup>5</sup> reported that the areas with sponge-like appearance were most likely composed of clusters of richly developed vessels, presumably varices with differing degrees and patterns of dilatation. It seems that these varices can impact the massive bleeding at the time of delivery, but our results suggest that this finding does not predispose to antenatal bleeding.

Placental lacunae and lack of clear zone have often been suggested as one of the US findings that trigger a suspicion of pathological adherence of the placenta.<sup>4,6,7</sup> However, in our study, pla-

cental lacunae, an anterior placenta, or a placenta located on a previous cesarean section scar was not associated with antenatal bleeding.

Velamentous cord insertion results from the abnormal development of the placenta from early gestation.<sup>8</sup> We hypothesized that such abnormal forms of the placenta coexisting with velamentous cord insertions were likely to detach from the decidua basalis. However, this could not be proven in the present study.

In cases of placenta previa, contractions, cervical effacement, and dilatation during the third trimester cause the separation of the placenta, leading to unavoidable antenatal abnormal bleeding.<sup>6</sup> Ghi et al showed that the cervical length measured on transvaginal US predicts the risk of emergency cesarean section at less than 34 weeks of gestation in women with complete placenta previa.<sup>2</sup> However, this was not confirmed in our study.

Although episodes of antenatal bleeding from placenta previa may predict the need for emergency cesarean section due to massive bleeding, we were unable to identify a US finding that could predict antenatal bleeding with the need for emergency cesarean sections. Therefore, the obstetrician should be aware that sudden bleeding during pregnancy may occur in patients with placenta previa, even if no other US findings, such as presence of placental lacunae, sponge-like findings in the cervix, an expanded marginal sinus, abnormal cord insertion, and/or a short cervical length, are present.

### REFERENCES

- Ghourab S. Third-trimester transvaginal ultrasonography in placenta previa: does the shape of the



- lower placental edge predict clinical outcome? Ultrasound Obstet Gynecol 2001;18:103.
2. Ghi T, Contro E, Martina T, et al. Cervical length and risk of antepartum bleeding in women with complete placenta previa. Ultrasound Obstet Gynecol 2009;33:209.
  3. Saitoh M, Ishihara K, Sekiya T, et al. Anticipation of uterine bleeding in placenta previa based on vaginal sonographic evaluation. Gynecol Obstet Investig 2002;54:37.
  4. Hasegawa J, Matsuoka R, Ichizuka K, et al. Predisposing factors for massive hemorrhage during Cesarean section in patients with placenta previa. Ultrasound Obstet Gynecol 2009;34:80.
  5. Hurton T, Morrill H, Mascola M, et al. Cervical varices: an unusual etiology for third-trimester bleeding. J Clin Ultrasound 1998;26:317.
  6. Oyelese Y, Smulian JC. Placenta previa, placenta accreta, and vasa previa. Obstet Gynecol 2006;107:927.
  7. Comstock CH, Love JJ Jr, Bronsteen RA, et al. Sonographic detection of placenta accreta in the second and third trimesters of pregnancy. Am J Obstet Gynecol 2004;190:1135.
  8. Hasegawa J, Matsuoka R, Ichizuka K, et al. Velamentous cord insertion into the lower third of the uterus is associated with intrapartum fetal heart rate abnormalities. Ultrasound Obstet Gynecol 2006;27:425.