Clinical Significance of Subchorionic and Retroplacental Hematomas Detected in the First Trimester of Pregnancy

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OBJECTIVE: To evaluate the long-term clinical significance of intrauterine hematomas detected in the first trimester of pregnancy in a general obstetric population.

METHODS: A prospective study was designed to compare perinatal outcomes in 187 pregnant women with intrauterine hematomas and 6488 controls in whom hematomas were not detected at first-trimester ultrasonographic examination.

RESULTS: The incidence of intrauterine hematoma in the first trimester in a general obstetric population was 3.1%. A retroplacental position of the hematoma was significantly correlated with an increased risk for adverse maternal and neonatal complications. The presence or absence of symptoms of threatened abortion did not affect these outcomes. The rates of operative vaginal delivery (relative risk [RR] 1.9; confidence interval [CI] 1.1, 3.2) and cesarean delivery (RR 1.4; CI 1.1, 1.8), as well as the rates of pregnancy-induced hypertension (RR 2.1; CI 1.5, 2.9) and preeclampsia (RR 4.0; CI 2.4, 6.7), were significantly greater in the hematoma group. Placental abruption (RR 5.6; CI 2.8, 11.1) and placental separation abnormalities (RR 3.2; CI 2.2, 4.7) were also significantly more frequent in the hematoma group. Perinatal complications, including the rate of preterm delivery (RR 2.3; CI 1.6, 3.2), fetal growth restriction (RR 2.4; CI 1.4, 4.1), fetal distress (RR 2.6; CI 1.9, 3.5), meconium-stained amniotic fluid (RR 2.2; CI 1.7, 2.9), and neonatal intensive care unit admission (RR 5.6; CI 4.1, 7.6), were also significantly increased in this group. Furthermore, the frequency of intrauterine demise and perinatal mortality was increased in the hematoma group, but this difference did not reach statistical significance (*P*s = .6 and .2).

CONCLUSION: Our study suggests that the presence of an intrauterine hematoma during the first trimester may identify a population of patients at increased risk for adverse pregnancy outcome. (Obstet Gynecol 2003;102: 94–100. © 2003 by The American College of Obstetricians and Gynecologists.)

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Intrauterine hematomas are commonly observed features on ultrasound examinations, especially among patients with clinically evident bleeding in early pregnancy. The incidence of first-trimester hematomas diagnosed by ultrasound has been reported to be 4–22%, depending on the patient population studied.[1] Since the initial description of this finding by Mantoni and Pedersen in 1981,[2] the resolution of ultrasound equipment has improved dramatically.

The diagnosis of intrauterine hematomas is becoming more common as indications for first-trimester ultrasonography, such as nuchal translucency measurement, increase. The clinical significance of intrauterine hematomas remains controversial. Three prior controlled studies have found an association between the presence of intrauterine hematomas and preterm delivery as well as spontaneous abortion, but two of those studies[3,4] involved a high-risk population. This study aims to investigate the relationship between the presence of an intrauterine hematoma and perinatal outcome in a general obstetric population. We hypothesize that the presence of a first-trimester hematoma might serve as an early marker for adverse perinatal outcome.

MATERIALS AND METHODS

This is a prospective, population-based study of the clinical significance of first-trimester intrauterine hematomas in a tertiary care hospital. Greater than 90% of women present in the first trimester for prenatal care at Petz Aladár County Hospital of Győr, Hungary, and all are offered a sonographic examination. All 7862 women who underwent routine first-trimester ultrasound examinations between January 1999 and December 2001 were recruited for participation. Inclusion criteria were

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the presence of a viable, singleton gestation between 5 and 12 weeks' gestation and delivery after 24 weeks' gestation. Patients with a nonviable fetus, multifetal pregnancy, or fetal abnormality diagnosed by ultrasonography were excluded. Women who underwent elective abortion or subsequently miscarried before 24 weeks' gestation were also excluded from the study. We compared the clinical outcome in a cohort of 187 patients with intrauterine hematomas with that in 6488 controls in whom a hematoma was not detected.

Gestational age was calculated based on last menstrual period or was corrected when the crown–rump length measurements were more than 5 days different from the last menstrual period. The following sonographic factors were evaluated: crown–rump length, yolk sac diameter, fetal heart rate, nuchal translucency thickness (if the fetus' estimated gestational age was 10–12 weeks), and location of the chorion frondosum. The size of the gestational sac was recorded in all cases. A hematoma was defined as a crescent-shaped, sonolucent fluid collection behind the fetal membranes or the placenta. The position of the hematoma relative to the placental site was described as subchorionic or retroplacental. The subchorionic hematoma was defined as being located between the chorion and the uterine wall, whereas the retroplacental hematoma was located behind the placenta. The location of the hematoma was marked as anterior, posterior, fundal, or cervical. The sonographic evaluation also included the size of the hematoma relative to the gestational sac size and was characterized as small (less than 20%), medium (20–50%), or large (greater than 50%). Volumes of the hematoma and gestational sac were estimated by measuring the maximum transverse, anteroposterior, and longitudinal diameters and multiplying these values by the constant 0.52, as was suggested by Campbell.[5] The correction factor of 0.52 is used to correct for the crescent shape of the hematoma. All measurements were performed with an ATL 3000 (Philips Medical Systems, Bothell, WA) by perinatologists in the department. When a hematoma was detected, it was reassessed every 7–14 days, depending on clinical symptoms, until it disappeared.

The departmental policy is to perform chorionic villus sampling (CVS) transabdominally between 13 and 14 weeks or amniocentesis at 16 weeks. As a result, no procedures were performed on any of these patients in the first trimester, and therefore the hematomas could not have been caused by an invasive procedure.

Patient demographic data and pregnancy data were obtained by a questionnaire, interview, and review of medical records. Specifically, symptoms of threatened abortion (eg, brownish discharge, spotting, bleeding, cramping) were documented. Maternal and neonatal outcome data were entered into a computerized perinatal database. Outcome variables analyzed included mode of delivery, birth weight, Apgar scores, occurrence of pregnancy-induced hypertension, preeclampsia, and placental abnormalities. Also analyzed were the incidences of meconium-stained amniotic fluid, fetal distress, preterm birth, fetal growth restriction, and neonatal intensive care unit (NICU) admission. Fetal distress was defined as persistent late decelerations or other heart rate patterns consistent with fetal hypoxia. The definition of preterm birth was a delivery at a gestational age of less than 37 weeks. Fetal growth restriction was defined by a birth weight of less than the tenth percentile for gestational age and sex according to Hungarian norms. The incidence of placental abnormalities was also evaluated and included placental abruption, cotyledon retention, and retained placenta requiring manual removal.

Categoric variables in the statistical analysis were assessed by χ^2 analysis or two-tailed Fisher exact test in cases of small–expected cell frequencies. Apgar scores were assessed by the Mantel–Haenszel χ^2 test for trend. Differences in continuous variables were evaluated by a two-tailed Student *t* test or, if the data were not considered to be normally distributed, by the Mann–Whitney *U* test. *P* values less than .05 were considered statistically significant. In addition, the relative risk of adverse perinatal outcomes and the 95% confidence intervals were calculated. All statistical computations were performed with SAS statistical software (SAS Institute Inc., Cary, NC). The study was approved by the Petz Aladár County Hospital Ethics Committee, and informed consent was obtained from all participants.

RESULTS

During the study period from January 1999 to December 2001, 7862 patients underwent routine first-trimester obstetric ultrasonographic examination at our institution. Of these, 262 had an intrauterine hemorrhage documented. Twenty-seven of the 262 were excluded because of the presence of multiple gestation (nine), nonviable fetus (13), or termination due to major congenital malformation (five). Five patients were lost to follow-up, leaving 230 patients with hematomas. Seven thousand six hundred patients with singletons did not have intrauterine hemorrhage. Of these, 425 were excluded because of the above-mentioned exclusion criteria, leaving 7175 patients without hematomas. Thus the overall incidence of intrauterine hematoma in patients with singleton intrauterine pregnancies was 230 of 7405 (3.1%).

Of the 230 patients with intrauterine hematomas, 43 (18.7%) had subsequent pregnancy loss at less than 24

Table 1. Comparison of Maternal Characteristics Between the Hematoma and Control Groups

	Hematoma (n = 187)	Control (n = 6488)	P
Maternal age	27.6 ± 5.0	28.4 ± 6.5	.17
Gestational age at first scan	9.8 ± 2.3	10.9 ± 1.4	<.001
Smoking	26 (13.9%)	912 (14.1%)	.95
Medical history			
Chronic hypertension	2 (1.0%)	93 (1.4%)	.68
Gestational diabetes	4 (2.1%)	162 (2.5%)	.73
Previous termination	54 (21%)	2156 (19.2%)	.21
Previous loss	65 (27.3%)	2234 (24%)	.93
Multiparity	94 (50%)	3547 (54.7%)	.23
Previous perinatal death	5 (1.6%)	110 (1.5%)	.31
Prenatal diagnosis in the second trimester (amniocentesis or CVS)	11 (5.8%)	541 (8.3%)	.23

CVS = chorionic villus sampling.

weeks, so 187 women were available for the study group. The 43 women with subsequent miscarriages were excluded from further analysis and will be the subject of another report. Of those without intrauterine hematomas, 687 (9.5%) spontaneously aborted. The control population is therefore comprised of 6488 women who delivered a singleton fetus at Petz Aladár County Hospital.

The most common location of the hematoma was anterior in 75 patients (40%). The other locations were cervical in 63 patients (34%), fundal in 30 (16%), and posterior in 19 (10%). The hematoma was subchorionic in 91 pregnancies (57%) and retroplacental in 68 of 159 pregnancies (43%). It was not possible to localize the hematoma in 28 cases because of early gestational age (less than 7 weeks). The size of the hematoma was characterized as small in 77 cases (41%), medium in 84 (45%), and large in 26 (14%), relative to the size of the gestational sac. Mean gestational ages were 9.8 weeks at detection of the hematoma and 10.8 weeks at the first ultrasound scan in the control group ($P < .001$).

Maternal characteristics are provided in Table 1. There were no significant differences between study and control groups with regard to maternal age, smoking history, and medical and reproductive history. The most frequent indications for prenatal diagnosis were advanced maternal age and ultrasound suspicion for chromosomal abnormality. In the study group 11 patients (5.8%) underwent amniocentesis, whereas none had CVS. Five hundred forty-one control patients had prenatal diagnostic procedures (8.3%), consisting of 462 amniocenteses and 79 CVSs.

The symptoms of threatened abortion, such as vaginal bleeding or discharge, with or without cramping were detected in 133 hematoma patients (71%), whereas 54 (29%) did not have any of these symptoms. The "silent hematoma" in these cases was diagnosed only by ultrasonographic examination.

The rate of operative vaginal delivery (vacuum extraction in our institution) was significantly greater in the hematoma group than in the control group (7.5% versus 3.9% [$P = .01$]), and the frequencies of cesarean delivery were 27.3% and 19.6%, respectively ($P = .009$) (Table 2). Interestingly, most of the indications for operative delivery were due to fetal distress and placental abruption, conditions that may be related to placental insufficiency.

Table 2 presents maternal complications during pregnancy and delivery. Pregnancy-induced hypertension was more common in the study group than in the control group (15.5% versus 7.5% [$P < .001$]), as was preeclampsia (8% versus 2% [$P < .001$]). Placental abruption was also significantly more frequent in the hematoma group (4.8% versus 0.9% [$P < .001$]). The incidence of manual uterine exploration or curettage because of postpartum bleeding or cotyledon retention was also more frequent in the hematoma group (13.9% versus 4.9% [$P < .001$]).

Table 2. Association Between First-Trimester Intrauterine Hematoma and Maternal Complications

	Hematoma (n = 187) (%)	Control (n = 6488) (%)	RR (95% CI)
Mode of delivery			
Vacuum extraction	14 (7.5)	252 (3.9)	1.9 (1.1, 3.2)
Cesarean	51 (27.3)	1269 (19.6)	1.4 (1.1, 1.8)
Perinatal outcome			
PIH	29 (15.5)	488 (7.5)	2.1 (1.5, 2.9)
Preeclampsia	15 (8.0)	130 (2.0)	4.0 (2.4, 6.7)
Gestational diabetes	17 (9.1)	603 (9.3)	0.98 (0.6, 1.5)
Placental abruption	9 (4.8)	56 (0.9)	5.6 (2.8, 11.1)
Cotyledon retention or fragmented placenta	26 (13.9)	280 (4.3)	3.2 (2.2, 4.7)
Manual uterine exploration or curettage	26 (13.9)	317 (4.9)	2.8 (2.0, 4.1)
Manual placental removal	15 (8.0)	149 (2.3)	3.4 (2.1, 5.8)

RR = relative risk; CI = confidence interval; PIH = pregnancy-induced hypertension.

Table 3. Comparison of Neonatal and Perinatal Complications Between the Hematoma and Control Groups

	Hematoma	Control	*P*	Hematoma (n = 187)	Control (n = 6488)	RR (95% CI)
Neonatal outcome						
GA at delivery (wk)	38.5 ± 2.8	38.3 ± 3.3	.36			
Birth weight (g)	3272 ± 769	3740 ± 528	<.001			
Apgar < 7 at 5 min	7 (3.7%)	43 (0.6%)	<.001			
Perinatal outcome						
Preterm delivery				30 (16%)	459 (7.1%)	2.3 (1.6, 3.2)
Fetal growth restriction				13 (6.9%)	191 (2.9%)	2.4 (1.4, 4.1)
Meconium-stained fluid				46 (24.6%)	719 (11.1%)	2.2 (1.7, 2.9)
Fetal distress				36 (19.2%)	487 (7.5%)	2.6 (1.9, 3.5)
NICU admission				39 (20.9%)	241 (3.7%)	5.6 (4.1, 7.6)
Congenital anomalies*†				3 (1.6%)	65 (1.0%)	1.6 (0.5, 5.0)
Intrauterine death†				2 (1.1%)	48 (0.7%)	1.4 (0.3, 5.9)
Perinatal mortality†				4 (2.1%)	78 (1.2%)	1.8 (0.7, 4.8)

GA = gestational age; NICU = neonatal intensive care unit. Other abbreviations as in Table 2.

* Minor anomalies or not diagnosed prenatally.

† Fisher exact test used to calculate *P* values because of small numbers.

Finally, manual removal of retained placenta was more common in the study group (8% versus 2.3% [$P < .001$]).

The neonatal birth characteristics are listed in Table 3. Mean gestational ages at delivery were similar in the two groups. Mean birth weights (3272 g versus 3740 g) and Apgar scores were statistically significantly lower in the study group ($P < .001$).

Perinatal outcomes are also shown in Table 3. The rate of preterm delivery was increased significantly in the study group (16%) relative to the control group (7.1%) ($P < .001$). The average gestational age of the preterm infants in the study group was 32.9 ± 3.2 weeks (range $24^{1}/_{7}$–$36^{4}/_{7}$). Forty-three percent of the patients who delivered preterm were younger than 34 weeks, and 10% delivered at less than 28 weeks. Spontaneous preterm labor presented in 11 women (37%), and preterm premature rupture of membranes in seven (23%). Twelve preterm deliveries were indicated, in cases of placental abruption (four), fetal distress (five), and preeclampsia (three). Twelve of 30 women with preterm deliveries had cesarean deliveries (40%).

Fetal growth restriction was significantly more common among the hematoma group (7% versus 3% [$P = .002$]). The rate of fetal distress in the hematoma group was also significantly higher than that in the control group (19.2% versus 7.5% [$P < .001$]). There were also greater frequencies of meconium-stained amniotic fluid (24.6% versus 11.1% [$P < .001$]) and NICU admission (20.9% versus 3.7% [$P < .001$]) in the hematoma group.

The frequencies of intrauterine death (1.1% versus 0.7% [$P = .6$]) and perinatal mortality (2.1% versus 1.2% [$P = .2$]) were also increased in the study group, but these differences did not reach statistical significance. There was also no difference in the incidence of congenital fetal anomalies between the two groups (1.6% versus 1% [$P = .4$]).

An analysis of perinatal outcomes by hematoma characteristics and clinical symptoms of threatened abortion revealed that there was no association between the presence of clinical symptoms at the time of detection of the hematoma and poor perinatal outcome. Interestingly, a retroplacental position of the hematoma was significantly correlated with an increased risk for adverse maternal and neonatal complications, such as fetal distress in labor, meconium-stained amniotic fluid, NICU admission ($P < .001$), preterm delivery ($P = .001$), preeclampsia ($P = .007$), and fetal growth restriction ($P = .04$). Although neither the size of the hematoma nor its location was associated with adverse outcome, fetal distress was significantly more frequent when the hematoma was located posteriorly ($P = .04$).

DISCUSSION

The clinical significance of intrauterine hematomas in patients with threatened abortion is relatively well documented. A review conducted in 1993, however, found no information available in the English language literature on the incidence or significance of either subchorionic or retroplacental hematomas in a population of normal pregnant women. Early studies of subchorionic hemorrhages focused on very selected populations (ie, women with threatened abortion or recurrent miscarriage) and reported incidences that varied between 4% and 22% (Table 4). Possible reasons for the discrepancy in these rates include variable patient populations, a wide range of gestational ages, and lack of a standard definition of intrauterine hematomas.

Table 4. Review of the Literature on Intrauterine Hematomas

Author (year)	No. of patients	Hematoma frequency (%)	Spontaneous abortion rate (%)	PTD (%)
Mantoni (1981)[2]	12	NA	2 (17)	1 (8)
Goldstein (1983)[6]	10	20	2 (20)	0 (0)
Jouppila (1985)[7]	33	NA	6 (19)	3 (11)
Saurbei (1986)[8]	30	NA	3 (10)	7 (23)
Abu-Yousef (1987)[9]	21	NA	12 (57)	3 (33)
Nyberg (1987)[10]	65	NA	6 (9)	15 (25)
Borlum* (1989)[4]	86	22.1	13 (16)	6 (15)
Mandruzzato (1989)[11]	62	11	8 (13)	7 (13)
Pedersen (1990)[12]	23	4	1 (4)	2 (9)
Baxi (1991)[13]	5	NA	0 (0)	1 (20)
Ball* (1996)[14]	317	1.3	16 (7)	27 (11)
Seki (1998)[16]	22	0.46	3 (14)	17 (77)
Tower* (2001)[3]	41	12	6 (15)	8 (32)

PTD = preterm delivery; NA = not applicable.
* Controlled study.

In 1996, Ball et al[14] reported that 317 of 24,291 low-risk patients were noted to have a subchorionic hemorrhage (1.3%). The overall incidence of intrauterine hematoma (3.1% [230 of 7405 singleton pregnancies]) in this series and that when those who subsequently aborted are excluded (2.8%; 187/6675 singleton live births) are similar to that found by Ball and colleagues and may represent an accurate incidence of intrauterine hematomas in a general obstetric population.

Although hematomas vary significantly in shape and size, most follow the arch of the uterus and form a crescent-shaped fluid collection between the uterine wall and the membranes. Published opinions on the clinical significance of the volume of intrauterine hematomas are controversial. Several authors have attempted to relate the size of the hematoma directly to pregnancy outcome and to determine whether this factor has predictive significance.[2,8,9] In most of the studies, including ours, the estimated volume of the hematoma did not correlate with the outcome of the pregnancy.[4,6,14] Perhaps it is the presence or absence of a hematoma as a marker of the integrity of placentation and not its size that is important.

We found that intrauterine hematoma identifies a gestation at risk for a number of complications including preeclampsia, pregnancy-induced hypertension, and placental abnormalities. Many of these complications fall under the rubric of impaired placentation. Our study confirms the findings of Tower and Regan[3] that the presence of a hematoma is associated with an increased risk for preeclampsia. The hematoma may be an early ultrasound marker of abnormal placentation or of preeclampsia, which is known to result from abnormal trophoblast invasion.[15]

We found a 5.8-fold increased risk of placental abruption in the hematoma group. It is possible that the initial cause of the hematoma and not the presence of the hematoma itself may be responsible for placental abruption in these patients. Support for that hypothesis is derived from the length of time between diagnosis of a hematoma in the first trimester and a third-trimester abruption.[14] Interestingly, not only premature separation but also abnormally adherent placentation was increased in our hematoma group. Our finding of an increase in the incidence of manually removed placentas in patients with hematomas is in accordance with previously published reports.[7,11] This may reflect the ability of a hematoma to impair normal placentation, or the hematoma could be a result of impaired placentation. Our study also demonstrates that patients with intrauterine hematomas are at a much higher risk for fetal growth restriction. Again, this supports the theory that abnormal placentation may be related to both the development of intrauterine hematomas and fetal growth restriction. Lastly, our findings of an increased risk of cesarean delivery in the hematoma group primarily due to fetal distress also support the theory of abnormal placental development and function in these women.

Preterm delivery is the most frequently investigated outcome in patients with subchorionic and retroplacental hematomas. Our report of a 16% rate of preterm delivery is consistent with the 12% reported by Pearlstone[1] but lower than the 32% preterm delivery rate reported by Tower.[3] It is important to emphasize that our preterm delivery rate of 16% occurred in a general obstetric population as opposed to the high-risk population studied by Tower. Despite the increased rate of preterm delivery, mean gestational ages at delivery were the same in our intrauterine hematoma and control groups because more intrauterine hematoma patients also delivered after their dates. It has been suggested that a localized accumulation of blood causes mechanical

uterine irritation and therefore stimulates contractions.[3] Another possible mechanism for the preterm uterine activity is bacterial colonization of the hematoma and endotoxin release with subsequent prostaglandin synthesis. Seki et al[16] found that 77% of pregnancies with a persistent subchorionic hematoma had delivery before 37 weeks, and six of their 22 cases (27.3%) had chorioamnionitis. The fact that all of those patients had hematomas that persisted until the time of delivery might explain this extremely high rate of preterm delivery and chorioamnionitis.

The frequency of fetal asphyxia, abnormal heart rate patterns, meconium-stained amniotic fluid, and low Apgar scores seen in the patients with intrauterine hematomas may be due to the increased rates of preterm delivery, fetal growth restriction, and placental abruption. In any event, the presence of intrauterine hematomas in the first trimester identifies a group of patients at higher risk for pregnancy complications.

Perinatal mortality can be thought of as the ultimate manifestation of disordered placentation. Our findings of an increased risk of intrauterine demise and perinatal mortality are consistent with previous reports[11,14]; however, mortality is a rare event, so the difference did not reach statistical significance.

Limitations of our study include the lack of a separate analysis of persistent hematomas versus those that resolved over time. Although most subchorionic hematomas, approximately 70%, resolve spontaneously by the end of the second trimester, some may persist until the end of the pregnancy, and it has been suggested that these have the potential to cause problems or complications for the mother or fetus.[16] Stratification of our data in this fashion would enable more precise prognostic information with which to counsel patients. We also did not compare the incidence of chorioamnionitis between the two groups, which is a possible confounding factor influencing the rate of preterm birth.

The presence of the hematoma could bias physician management of labor, in theory. Although physicians were aware of the presence of first-trimester hematomas, labor management was affected by obstetric factors like the course of labor, the pelvis, and the fetal heart rate tracing. It is not common knowledge that the presence of a hematoma 6 months before might serve as a marker for adverse perinatal outcome. No patient is currently offered third-trimester antenatal testing for this indication, and physicians are not likely to base labor management decisions on this finding.

Lastly, pathologic examination of the placentas might have added to our understanding of the role of intrauterine hematomas in abnormal placentation. Further understanding of the etiology of the hematoma might direct a workup for other medical conditions that can lead to adverse outcome, including lupus erythematosus and one or more of the thrombophilias.

Intrauterine hematomas occur in 3.1% of a general obstetric population and are associated with adverse pregnancy outcome. Our study suggests that the presence of a first-trimester intrauterine hematoma may be a useful sign to identify a population of patients at greater risk for adverse pregnancy outcome. Based on our findings, the presence of intrauterine hematomas might be an indication for sonographic evaluation for fetal growth later in pregnancy as well as third-trimester antenatal testing. Indeed, the ultimate goal of triaging patients into low-risk and high-risk populations is to more accurately target our available forms of surveillance and therapy.

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