Clinical significance of subchorial and retroplacental hematomas detected in the first trimester of pregnancy

Semmelweis University
“Fetal and neonatal medicine”
Ph.D. programme

Author:
Sándor Nagy, M.D.

Supervisor:
Zoltán Papp, M.D., Ph.D., D.Sc.

Program director:
Zoltán Papp, M.D., Ph.D., D.Sc.

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Introduction

The ultrasound screening in the first trimester of pregnancy is controlled by protocol of the Hungarian Society of Ultrasound in Obstetrics and Gynecology, so nearly the 90% of the pregnant population is screened. The diagnosis of early pregnancy failure and placental abnormalities has changed as the resolution of ultrasound equipment has improved. The incidence of first-trimester hematoma diagnosed by ultrasound has been reported to be 4-22%, depending on the patient population studied.

Spontaneous abortion is one of the most common complications of pregnancy, every 12-15 out of hundred conceptus are miscarried in the first half of gestation. This means more than 15,000 abortions per year in our country. The extent of this question involves serious medical, psychological and economical significance, especially for the issue of declining fertility rate. Vaginal bleeding is one of the most serious symptom of the spontaneous abortion, which the pregnant afraid of, especially when extrachorial bleeding is detected by ultrasound.

The clinical significance of intraterine hematoma remains controversial. Prior studies have found association between the presence of the hematoma and spontaneous abortion as well as adverse perinatal outcome. There is a great academic and clinical interest in the events of implantation as it is increasingly accepted that these events may determine the future course of gestation.

The ultrasound diagnosis can evaluate the morphologic and also the functional parameter of these abnormalities.

I have been focusing my attention to the clinical significance of subchorial and retroplacental hematomas in early pregnancy for six years at our department. In my dissertation I’d like to summarize my experience on this issue.

Aims

The clinical significance of intrauterine hematoma is controversial. Four prior controlled studies have found an association between the presence of hematoma and preterm delivery as well as spontaneous abortion, but two of those studies involved a high-risk population. To my knowledge there is no controlled clinical study in the Hungarian medical literature which involves general obstetric population.
The aim of my study was to evaluate the association between the subchorial and retroplacental hematomas early pregnancy loss as well as perinatal complications. I hypothesize that the presence of a first-trimester hematoma might as an early marker for adverse perinatal outcome.

Objectives:

1. What is the incidence of extrachorial hematoma in a general obstetric population?
2. Are the morphologic characters useful in prediction of the rate of spontaneous abortion? Has any practical advantage of the detection of intrauterine hematoma in the pregnancy care?
3. Is the diagnosis of intrauterine hemorrhage useful in predicting of adverse perinatal outcome?
   a. Analyze the change of the mode of delivery
   b. Evaluate the risk of maternal perinatal complications, like preeclampsia and pregnancy induced hypertension and placental abnormalities
   c. Estimate the incidence of neonatal complication as preterm birth, IUGR, NICU admission
   d. Analyze the association between the morphologic characteristics of the hematoma and the outcome variables
   e. Suggest methods to prevent these complications during pregnancy care
4. May the hematoma effect the Doppler flow characteristics of spiral arteries and intervillous space? Can we prognose the adverse perinatal outcome in this altered placental circulation?
Material and methods

This was a prospective, population-based study, in which all pregnant women till 12 weeks of gestation was screened in our tertiary care hospital. All 7862 women who underwent routine first-trimester ultrasound examination between January 1999 and December 2001 were recruited for participation. According to their pregnancy outcome patients were separated into two groups.

1. In the first part of the study the inclusion criteria were the presence of a viable, singleton gestation between 5 and 12 weeks’ gestation with intrauterine hematoma. I compared 43 patients, who spontaneously aborted with those 187 pregnant women who delivered after 24 weeks.

2. In the second part I analyzed and compared the clinical outcome in a cohort of 187 patients with intrauterine hematoma with that in 6488 controls in whom a hematoma was not detected.

Patients with a non-viable fetus, multifetal pregnancy, or ultrasound diagnosed fetal abnormality were excluded. Women who underwent elective abortion or subsequently miscarried prior to 24 weeks gestation were also excluded from the study.

Gestational age was calculated based on last menstrual period, or was corrected when the crown-rump-length (CRL) measurements was >5 days different from last menstrual period. The following sonographic factors were evaluated: CRL, yolk sac diameter, fetal heart rate (FHR), nuchal translucency thickness, 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, while 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 (<20%), medium (20-50%) or large (>50%). The volume of the hematoma and the 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 ATL 3000 (Philips Medical System, Bothell, Washington) 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 13-14 weeks, or amniocentesis (AC) 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, e.g. brownish discharge, spotting, bleeding or 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, the occurrence of chronic hypertension, preeclampsia and placental abnormalities. Also analyzed were the incidences of meconium stained amniotic fluid, fetal distress, preterm birth, intruterine growth retardation (IUGR), and 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 gestational age less than 37 weeks. IUGR was defined by a birth weight < 10th percentile for gestational age and sex according to Hungarian norms. The incidence of placental abnormalities was also evaluated and included retained placenta, cotyledon retention and other placental abnormalities.

Doppler-study

After much research and practical preparation last year I had an opportunity to start studying the blood flow in the spiral arteries and intervillous space in first-trimester pregnancies.

Power and pulsed Doppler examinations of uteroplacental circulation was performed in 60 patients in a prospective controlled study. The examinations were performed in 30 healthy women without symptoms attending a clinic for termination of pregnancy in the late first trimester between 8 and 12 weeks’ gestation and another 30 patients with uterine bleeding. The equipment was used an ATL HDI 3000 (Philips Medical System, Bothwell, Washington) ultrasound system with a 6,5MHz transvaginal trancducer.

The thermal and mechanical effect of Doppler ultrasound can damage the embryo especially during the organogenesis. Therefore, I paid attention to ISUOG safety statement which says that the exposure time and acoustic output should be kept to the lowest levels during this examination. I compared the peak systolic velocities, the resistance and pulsatile indeces in both groups. Examinatio time was never longer than 20 minutes.
Statistical analysis

Categorical variables were assessed by $\chi^2$ analysis and two-tailed Fisher’s exact test in cases of small-expected cell frequencies. Means of continuous variables were compared by two-tailed Student’s $t$-test. P-values < 0.05 were accepted as indicating statistical significance. In addition, odds ratios of adverse perinatal outcomes, together with 95% confidence intervals, were calculated. All statistical computations were performed with SAS statistical software (SAS Institute Inc; Cary, NC).

Results

During the study period 7862 patients underwent routine first trimester obstetric ultrasonographic examination at our institution. Of these, 262 had an intrauterine hemorrhage documented. 27 out of the 262 were excluded, due to the presence of multiple gestation, [9], non-viable fetus [13] or termination due to major congenital malformation [5]. Five patients were lost to follow-up. Of the remaining 230 patients, 43 (18.7%) had subsequent pregnancy loss <24 weeks leaving 187 women available for the study group.

7600 patients with singletons did not have intrauterine hemorrhage. Of these, 425 were excluded because of the above mentioned exclusion criteria, and 687 (9.5%) spontaneously aborted. The control population is therefore comprised of 6488 women who delivered a singleton fetus in our department. The incidence of intrauterine hematoma in the first trimester in a general obstetric population was 3.1%.

Spontaneous abortion group

The rate of spontaneous abortion was 18.7%, which is two times higher then in those pregnant women without hematomas. There was no significant difference with regard to maternal age, and medical history such as chronic hypertension (p= 0.66), gestational diabetes (p= 0.31), termination of pregnancy (p= 0.86), previous loss (p= 0.39) and perinatal death (p= 0.35). Retroplacental (p= 0.72) or subchorionic (p= 0.72) position of the hematoma was not significantly correlated with an increased risk for spontaneous abortion. The cervical (p= 0.004) and posterior (p= 0.002) location of the hematoma has significantly influenced the risk of abortion. The abortion rate was lower with cervical hematoma and higher with posterior hematoma. The abortion rate was significantly greater in those who were spotting (p= 0.02), bleeding (p= 0.03) or crumping (p= 0.001), but not in those who were discharging (p= 0.1). Among patients having no symptoms the rate of abortion was significantly lower (p= 0.02). The volumen ratio of the haematoma and the gestational sac was significantly greater in the abortion group (p< 0.001).
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 out of 159 pregnancies (43%). It was not possible to localize the hematoma in 28 cases, because of early gestational age (<7 weeks). The size of the hematoma was characterized as small in 77 (41%), medium in 84 (45%) and large in 26 (14%) caess, as compared to the size of the gestational sac. The mean gestational age was 9.8 weeks at detection of the hematoma, and 10.8 weeks at the first ultrasound scan in the control group, p=<.001.

Vaginal bleeding or discharge, with or without cramping was detected in 133 (71%) patients, while 54 (29%) did not have any of these symptoms. The rates of operative vaginal delivery (RR:1.9; CI:1.1-3.2) and cesarean (RR:1.4; CI:1.1-1.8) were significantly greater in the hematoma group as compared to the control group, 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). Placental abruption (RR:5.6; CI:2.8-11.1), and the incidence of placental separation abnormalities was also significantly more frequent in the hematoma group (RR:3.2; CI:2.2-4.7). Perinatal complications, including the rate of preterm delivery (RR:2.3; CI:1.6-3.2), intrauterine 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 NICU 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=0.6 and p=0.2).

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 (Table 7). While 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=0.04). Not surprisingly, gestational age at delivery, birth weight and Apgar scores were significantly decreased in patients with preeclampsia, IUGR, fetal distress and NICU admissions.
Doppler assessment

The peak systolic velocity, the resistance index and also the pulstile index were significantly higher in the hematoma group compared with the normal control group.

1. table  Comparison of blood flow characteristics in spiral arteries in normal and abnormal pregnancy

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Normal</th>
<th>Hematoma</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSV</td>
<td>17,7 cm/s</td>
<td>28,7 cm/s</td>
<td>&lt; 0,05</td>
</tr>
<tr>
<td>PI</td>
<td>0,61</td>
<td>0,83</td>
<td>&lt; 0,05</td>
</tr>
<tr>
<td>RI</td>
<td>0,45</td>
<td>0,67</td>
<td>&lt; 0,05</td>
</tr>
</tbody>
</table>

PSV: peak systolic velocity, PI: pulsatility index
RI: resistance index
Conclusions

1. This was the first controlled study in Hungary to investigate the incidence of intrauterine hematoma in a general obstetric population, which was 3.1%.

2. The subchorionic or retroplacental location of the hematoma doesn’t influence the rate of spontaneous abortion. The abortion rate with cervical localisation of the hematoma is significantly lower and with posterior localisation of the hematoma is significantly higher. The volume of the haematoma significantly greater in the abortion group.

3.a The rate of cesarean section and vacuum extraction is significantly higher in patients with hematoma diagnosed in the first trimester of pregnancy.

3.b Pregnancy induced hypertension and preeclampsia is more common in pregnant women with subchorionic or retroplacental hematoma, and also the placental abruption.

3.c The rate of preterm delivery, IUGR, fetal distress and the NICU admission increased significantly in patients with extravillous hematoma.

3.d There is no correlation between the size of the hematoma and the adverse perinatal outcome.

3.e The presence and the characteristic of an intrauterine hematoma during the first trimester may identify a population of patients at increased risk for adverse pregnancy outcome. 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.

4. The findings of my study support the use of spiral artery and intervillous space Doppler investigation for the non-invasive assessment of disturbances of trophoblast invasion in early pregnancy. My research suggests that the velocity and impedance of the spiral arteries increase in patients with first-trimester intrauterine hematoma.
Peer reviewed articles in the topic


Abstracts it the topic


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