Subchorionic hematoma volume in the first trimester and risk of spontaneous abortion

Volumen del hematoma sub-coriónico en el primer trimestre y riesgo de aborto espontáneo

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Short title: Subchorionic hematoma and risk of spontaneous abortion

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Abstract

Objective: to establish an association between subchorionic hematoma volume and risk of spontaneous abortion.

Methods: patients with viable intrauterine pregnancy between 6 and 13 weeks were included and with diagnosis of subchorionic hematoma with or without genital bleeding and visible heart rate by ultrasound. Patients were divided into two groups depending on the interruption or continuity of pregnancy: patients who presented spontaneous abortion and patients who continued with their pregnancy after the first trimester.

Settings: Maternity "Dr. Armando Castillo Plaza" and Hospital "Dr. Urquinaona". Maracaibo, Venezuela.

Results: Two hundred patients were selected. The gestational age at the moment of the ultrasound evaluation was 9.2 ± 2.0 weeks and the mean value of subchorionic hematoma volume was 22.4 ± 12.2 cm^3. The rate of spontaneous abortion in the group was 33.5%. Patients who presented spontaneous abortion did not show significant differences in the maternal age and gestational age at the moment of the ultrasound evaluation compared to those who continued with their pregnancy (p = ns). Patients with spontaneous abortion presented higher mean values of subchorionic hematoma volume (p = 0.05). Relative risk were significant for groups who presented hematomas considered big (relative risk = 1.74; interval confidence 95%, 1.20 – 2.44) and very big (relative risk = 4.19, interval confidence 95%, 2.51 – 7.02; p < 0.05).

Conclusion: There is an association between the first trimester subchorionic hematoma volume and an increased risk of spontaneous abortion.

Keywords: Subchorionic hematoma; Spontaneous abortion; Risk; Ultrasound; Pregnancy.

Resumen

Objetivo: Establecer la asociación entre el volumen del hematoma subcoriónico en el primer trimestre y riesgo de aborto espontáneo.

Métodos: Se incluyeron pacientes con embarazos intrauterinos viables entre 6 y 13 semanas y diagnóstico de hematoma subcoriónico con o sin sangrado genital y frecuencia cardiaca visible por ultrasonido. Las pacientes fueron posteriormente divididas en dos grupos dependiendo de la interrupción o no del embarazo: pacientes que presentaron abortos espontáneos y pacientes que continuaron con el embarazo más allá de la primera mitad de este.

Ambiente: Maternidad "Dr. Armando Castillo Plaza" y Hospital Central "Dr. Urquinaona". Maracaibo, Venezuela.

Resultados: se seleccionaron 200 pacientes. La edad gestacional al momento de la evaluación ecográfica de 9,2 ± 2,0 semanas y el volumen promedio del hematoma subcoriónico de 22,4 ± 12,2 cm^3. La tasa de aborto espontáneo en el grupo de pacientes seleccionadas fue de 33,5%. Las pacientes que presentaron abortos no presentaron diferencias significativas en edad materna y edad gestacional al momento de la evaluación ecográfica comparado con las pacientes que continuaron con el embarazo (p = ns). Las pacientes con abortos presentaron valores promedio mayores del volumen del hematoma subcoriónico (p = 0,05). El riesgo relativo fue significativo para los grupos que presentaron hematomas considerados grandes (riesgo relativo = 1,74; intervalo de confianza 95%, 1,20 - 2,44) y muy grandes (riesgo relativo = 4,19; intervalo de confianza 95%, 2,51 – 7,02; p < 0,05).

Conclusión: Existe asociación entre el volumen del hematoma subcoriónico en el primer trimestre y aumento del riesgo de aborto espontáneo.

Palabras claves: Hematoma subcoriónico; Aborto espontáneo; Riesgo; Ecografía; Embarazo.

Introduction

Subchorionic hematomas are common ultrasound findings that can be associated with bleedings of the first trimester of pregnancy, occurring in 5-25% of all the pregnancies, and normally diagnosed accidentally or during the evaluation of patients with bleeding[1,2]. Many sonographers report the presence or absence of subchorionic hematoma, not only to supply an explanation of maternal symptoms but also as a forecast sign of the probable result of the pregnancy[3,4]. These hematomas are generally hypoechoic or anechoic, with elevated areas of the placental edge that separates the uterine wall from the chorion and may be diagnosed early during the first trimester[5,6].

Subchorionic hematomas usually originate from the placenta. The mechanisms that relate them with obstetric complications may rely on the fact that the bleeding between the chorionic membrane and the uterine wall produces a lot of effects on the development and complications of the pregnancy[7]. In most of the cases, the etiology is unknown, but can be associated with pre-existing medical pathologies such as autoimmune diseases and immunological factors[8,9].

There are reports that have described the association of the diagnosis of subchorionic hematoma with different complications during pregnancy[10]. Some reports have suggested that the hematoma increases the risk of alterations of the intrauterine growth, causes premature abruption of the placenta, premature break of membranes, preeclampsia and preterm delivery[11]. However, other researchers have not confirmed these facts[12,13]. There are controversies about the possible association of different secondary obstetric pathologies of subchorionic hematoma with the number of pregnancies, volume of subchorionic hematoma, maternal age, gestational age at the moment of the diagnosis and the frequency of abortions[1,2,14,15], but the association between the volume of the subchorionic hematoma and the risk of spontaneous abortion has not yet been completely established.

The objective of this research was to establish the association between the volume of the subchorionic hematoma in the first quarter of pregnancy and the risk of spontaneous abortion.

Materials and methods

The research was carried out in pregnant women during their first trimester. They attended the obstetrics emergency of the maternity "Dr. Armando Castillo Plaza" and Hospital "Dr. Urquinaona", from July 2013 to November of 2014. The research was approved by the Committee of ethics and research of both hospitals and a written consent of patients was obtained.

Patients with viable intrauterine pregnancies between 6 and 13 weeks were included with diagnosis of subchorionic hematoma with or without genital bleeding and visible heart rate by ultrasound. During the research were excluded patients with multiple pregnancies, not viable pregnancies, presence of pathological conditions such as uterine fibroids, polyps or congenital anomalies, systemic pathologies as endocrinopathies, liver diseases, alterations of the coagulation, kidney or autoimmune diseases. Additionally, those patients who refused to participate in the research or those whose follow-up was impossible to perform.

All patients underwent full interrogation in which were included medical, surgical and obstetric backgrounds. A previous sonogram was asked, made before their inclusion in the research. The gestational age was confirmed by the date of the last menstrual period and by any ultrasound evaluation before the exploration, and in case of any discrepancy greater of 7 days between both calculations, the result of this last was used. The ultrasound evaluation was performed exclusively by an investigator and with the same Ultrasound (General Electric® Logiq Pro 3) with 3.5 transducers and 5 Mhz in real time, in longitudinal, oblique, and transverse plans to have a better appreciation of the hematoma. All patients with living embryos or fetuses and subchorionic hematomas were re-evaluated in intervals of 7 to 10 days, repeating the evaluation until the resolution of the subchorionic hematoma, an interruption of pregnancy or that it exceeds 20 weeks.

Subchorionic hematoma is defined as hypoechoic or anechoic areas, with elevated areas and free of echoes between the chorionic membrane and the myometrium. The volume of the hematoma was estimated by measuring the following diameters: transverse, anteroposterior and maximum longitudinal and multiplying these values by 0.52 and expressed in cubic centimeters (cm^3). The 0.52 correction factor is used to correct the shape of the hematoma, as suggested by Stabile and collaborators[16].

The patients were divided in two groups depending on the interruption or continuity of pregnancy: patients that presented abortions and patients who continued with their pregnancy more beyond the first half of it. Subsequently, these patients were divided into quartiles accord-

ing to the volume of the hematoma and divided in four groups: small, medium, big and very big hematoma. This division allowed establishing the association between the volume of the subchorionic hematoma and the risk of spontaneous abortion.

The data analysis was performed using the t Student test for the quantitative data and Fischer exact test for the qualitative data. The logistic regression analysis was used to estimate the relative risk of spontaneous abortion controlling simultaneously all the risk factors included in this research (maternal age, number of pregnancies, gestational age at the moment of the ultrasound evaluation and volume of subchorionic hematoma). Tendency tests were conducted using the binary logistic regression. Relative risk was calculated for those cases in the group of moderate, big, and very big hematoma according to the volume of the subchorionic hematoma contrasted to the group of small hematoma. P< 0.05 was considered statistically significant.

Results

Two hundred patients were selected during the research period with ultrasonography evidence of living embryo-fetus and subchorionic hematoma during the first quarter, whose characteristics are shown in table 1. The maternal age average of patients was 28.7 ± 8.2 years with a gestational age at the time of the ultrasound evaluation of 9.2 ±2.0 weeks and the average volume of the subchorionic hematoma was of 22.4 ± 12.2 cm^3.

Table 1. General Characteristics

n (%)	n = 200
Age, years	28.7 ± 8.3
Previous pregancies, number	1.9 ± 1.1
Gestational age at the moment of the ultrasound, weeks	9.2 ± 2.0
Volume of the subchorionic hematoma, cm^3	22.4 ± 12.2

The rate of spontaneous abortion in the group of selected patients was 33.5%. The characteristics of the patients who presented abortions compared with those that did not present interruption of the pregnancy are shown in the table 2. Even though the patients who presented abortions had a higher maternal age (28.8 ± 6.4 years compared with 27.8 ±8.3 years) and a higher gestational age at the moment of the evaluation (9.5 ± 1.8 weeks compared with 9.1+ /- 2.0 weeks) both differences were considered not significant (p = ns). However, it was observed that the patients with abortions presented average values higher to the volume of the subchorionic hematoma (32.0 ± 15.0 cm^3) compared with the patients who continued their pregnancy (17.6 ± 6.4 cm^3; p = 0.05).

Table 2. Characteristics of the patients according to the interruption or continuity of the pregnancy

	Patients with abortion (n = 67)	Patients without abortion (n = 133)	p
Age, years	28.8 ± 6.4	27.8 ± 8.3	ns
Previous pregancies, number	1.8 ± 1.1	1.9 ± 1.0	ns
Gestational age at the moment of the ultrasound, weeks	9.5 ± 1.8	9.1 ± 2.0	ns
Volume of the subchorionic hematoma, cm^3	32.0 ± 15.0	17.6 ± 6.4	< 0.05

The relative risk of pregnancy interruption among the groups with different volumes of subchorionic hematoma is shown in table 3. No statistically significant differences were found in the maternal age, number of pregnancies and gestational age at the time of the ultrasound evaluation between the groups of patients with medium, big and very big hematomas compared with the group of small hematomas (p = ns). The relative risk was significant for the groups that presented hematomas considered big (relative risk = 1.74) and very big (relative risk = 4.19; P for tendency < 0.05). Medium hematomas showed no differences in the relative risk compared with the small hematomas (p = ns). The risk adjustment by maternal age, number of pregnancies and week when the ultrasound evaluation was performed did not modify the risk (p = ns).

Table 3. Relative risk of abortion according to volume quartiles of subchorionic hematoma

	Small (n = 50)	Medium (n = 50)	Big (n = 50)	Very big (n = 50)
Abortion, n (%)	5 (10)	9 (18)	15 (30)	38 (76)
Volume of the hematoma, cm^3	9.6 ± 2.3	17.1 ± 1.7	23.7 ± 2.3	39.6 ± 10.0
Rank of the hematoma, cm^3	6 - 14	15 - 20	21 - 27	28 - 58
Age, years	30.7 ± 6.2	28.5 ± 6.7	27.6 ± 5.5	27.9 ± 6.6
Previous pregancies, n	1.7 ± 1.1	2.0 ± 1.2	2.0 ± 1.1	1.8 ± 1.1
Gestational age at the moment of the ultrasound, weeks	9.4 ± 1.8	9.2 ± 2.0	9.1 ± 2.1	9.3 ± 2.0
Relative risk	--	1.34	1.74	4.19
Trustable interval of 95%	--	0.86 – 2.11	1.20 – 2.44	2.51 – 7.02

Discusion

Subchorionic hematomas are common findings during the ultrasound evaluation in the first trimester of pregnancy. The clinical effects of their presence during this time are not completely known[6]. Some authors have reported a significant association with spontaneous abortions and other pregnancy complications such as preeclampsia, placental abnormalities and preterm delivery[3,15]. The results of the current research show that the presence of subchorionic hematomas over 20 cm^3 is associated with a marked increase in the risk of spontaneous abortion.

Subchorionic bleeding is not well recognized in the ultrasound literature. There are two factors that probably contribute to confuse the diagnosis: the thickness of membranes and the consistency of the hematoma, which can be confused with amniotic liquid when it is anechoic, with the myometrium when it is isoechoic and with the placenta when it is hyperechoic[4].

Subchorionic hematoma probably occurs because of the marginal placental abruption during the first half of pregnancy. Because of unknown reasons, the blood, instead of storing behind the placenta as occurs in the third quarter, opens through the chorionic membrane, with compression of the gestational sac, and then steps toward the cervical canal. The echogenicity of the hematoma usually depends on evaluation time with respect to the first episode. The fresh blood is usually anechoic, when organized it becomes more echogenic and when it starts to hemolyze it becomes anechoic[4].

Different researches have tried to correlate pregnancy complications with different clinical and ultrasound findings. Two studies did not find any correlation between different obstetric complications and the volume of the hematoma[17,18]. However, other studies found that the volume of the hematoma had a significant correlation with complications during pregnancy. Sauerbrei and collaborators[19] found that the volume of the hematoma was the main prognostic factor related to complications of pregnancy, suggesting that patients with hematomas smaller than 60 cm^3 and a relative volume of 0.4 with respect to the gestational sac have more favorable results. Other two investigations[20,21] reported that patients with hematomas bigger than 50 ml have increased complications during pregnancy. In the current research is found that pregnant women with hematomas bigger than 20 cm^3 have greater risk of spontaneous abortion.

The current research evaluated the association between the risk of spontaneous abortion and the volume of the hematoma, maternal age, gestational age at the moment of the ultrasound evaluation and number of pregnancies as possible risk factors in pregnancies complicated with subchorionic hematoma in the first quarter.

Maternal age is considered an independent risk factor for complications during pregnancy because there is a strong correlation with chromosome and structural anomalies of the fetus[6]. The results of the research did not show a relationship between the spontaneous abortion and the increase of the maternal age, which is contrary to the reported by Bennett and collaborators[22].

The risk of spontaneous abortion is independent to the gestational age at the time of the ultrasound evaluation, contrary to what was reported before in which the risk of abortion increased 2.4 times when the hematoma was diagnosed before the 9 weeks[2,6]. A prospective study conducted by Dongol and collaborators[23] reported that abortion occurred in 27% of the evaluated patients, which is markedly lower than the observed in the current investigation. The findings of this research did not show a significant relation between gestational age at the time of the ultrasound evaluation of the subchorionic hematoma and the development of abortion, which is contrary the information reported before[1,2,14]. It has been described that the rate of abortion is higher at a lower gestational age.

The relation between the volume of the hematoma and complications of pregnancy, particularly in relation to spontaneous abortion, is controversial[14,24]. When classifying in quartiles the volume of the hematoma in small, medium, big and very big, the abortion rate obtained in each category is 12%, 20%, 30% and 82%, respectively. The relative risk of abortion is 1.74 for big hematomas (21-27 cm^3) compared with the small hematomas and 4.19 for very big hematomas (28-58 cm^3) compared with the small hematomas (6-14 cm^3). This is similar to the information reported by Bennet and collaborators[22] and contrary to what has been reported by Pedersen and collaborators[12].

The subchorionic bleeding can affect pregnancy in several ways. Theoretically, a hematoma of big volume can threaten the continuity of the pregnancy by the effect of the direct pressure volume. It can also depend on the location of the hematoma, its distance from the location of the placenta and the volume of the hematoma[25]. The bleeding during the first trimester with or without the formation of the hematoma can be associated with a chronic inflammatory reaction in the decidua producing persistent myometrial activity and interruption of the pregnancy[26]. It is known that approximately in two thirds of interrupted pregnancies there are alterations in the placentation, characterized by more fine and fragmented layers of the trophoblast and a reduction of the citotrophoblastic invasion in spiral arteries leading to a weakening and eventual rupture of the placental structures[27].

Conclusion

The findings of this research allow concluding that there is a relation between the volume of the subchorionic hematoma in the first trimester and increased risk of spontaneous abortion.

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