

Evaluation Of Uterine Blood Flow In Threaten Abortion Using Color Doppler

Muna Ahamed Mohamed^{*1}, MEM Gar-elnabi¹, Mutasim Ahmed Aseed², Elsafi Ahmed Abdulla¹, Ikhlas Abdelaziz Hassan¹, Asma Ibraheem¹, Fatima Dahy¹

¹College of Medical Radiologic Science-Sudan University of Science and Technology, Khartoum-Sudan

²Khartoum teaching hospital, Medical Specialist council .

Abstract

Threaten abortion is one of the most controversial condition concerning the judgment where subjectivity mostly cause a hesitant in conclusion, therefore the main objective of this study was to used color Doppler indices to identify threaten abortion case objectively. This study was conducted using GE Medical Systems LOGIC TM5 ultrasound machine. The data was collected form 200 pregnant ladies (100 with threaten abortion and 100 with normal pregnancies). The data were acquired using color Doppler where blood flow indices were recorded as well as the status of hematoma and pregnancy loss. The result of the study showed that there is a significant difference between the peak systolic velocity concerning the control group and threaten abortion at $p = 0.05$ as well the presence of hematoma or the occurrences of loss significantly alter the blood flow in threaten abortion group.

Key Words: threaten, abortion, hematoma, Pulsatility index (PI) Resistance index (RI), peak systolic velocity (PSV)

Received : 15 Sep 2013

Accepted : 11 Nov 2013

Published:30 Dec 2013

INTRODUCTION

The risk of having spontaneous abortion for the first time is about 20% and 28% after two miscarriages and 43% after three or more miscarriages[1]. Studies have confirmed that the higher rate of adverse pregnancy outcome when a large sub-chorionic hematoma was present although the excess risk attributable to this finding appeared small when compared to a control population with vaginal bleeding in absence of a sub-chorionic hematoma [2].

Threatened abortion is a clinically descriptive term that applies to women during the first 20 weeks of pregnancy who have any bloody vaginal discharge or vaginal bleeding and a closed internal cervical OS; of those women who bleed in early pregnancy, approximately one half will be aborted[2,4]. Doppler assessment of the placental circulation plays an important role in screening for impaired placenta and its complications of pre-eclampsia, intrauterine growth restriction and prenatal death. Assessment of the fetal circulation is essential in the better understanding of the patho-physiology of a wide range of pathological pregnancies and their management [5].

Uterine blood flow is an important factor contributing to uterine receptivity which can be studied by means of transvaginal pulsed and color Doppler [6]

Sieroszewski et al. [7] they found that threatened abortion is one of the major problems in obstetrics and applies to one third of all pregnancies. The aim of their study was to establish normal ranges for Doppler indices of the flow velocity waveforms in uterine arteries (S/D, RI, PI) and ss-hCG serum concentrations in a control group in the first trimester of pregnancy. The obtained values were compared with those obtained in pregnancies threatened by abortion (6 - 11 weeks). Investigated groups; 55 controls and 47 with symptoms of threatened abortion, 27 of them aborted. Ultrasound examinations were carried out by

Address for correspondence*

Dr. Muna Ahamed Mohamed

College of Medical Radiologic Science-Sudan University of Science and Technology, Khartoum-Sudan

E-mail: munaahmeddali@gmail.com

means of an endovaginal probe. Serum ss-hCG was determined by immunoenzymatic method. They observed negative correlation between gestational age and RI and negative tendencies for S/D and PI indices in the control group. Positive correlation ($p < 0.05$) was found between ss-hCG serum concentration and gestational age (up to 9th week) and significant differences in ss-hCG concentrations between both examined groups. There were also statistical differences for S/D, RI and PI indices in both analyzed groups for each week of pregnancy. They conclude that measurement of the quality parameters of the flow velocity waveforms in uterine arteries and calculation of beta-hCG concentration in serum are useful methods in diagnosis of threatened abortion in the first trimester of pregnancy. Therefore the main objective of this study was to Evaluation uterine blood flow in threaten abortion using color Doppler indexes in order to have an objective method to identify this type of abortion.

MATERIAL AND METHODS

Ultrasound machine

The data were collected by using GE Medical Systems LOGIC TM5 Expert, made by Yocogama medical systems LTD –JAPAN – model 2302650, serial number 1028924, manufactured April 2005. LOGIQ 5 is a premium multipurpose imaging system designed for abdominal, vascular, obstetrics, gynecology, cardiology, neonatal, urology, transcranial.

A transvaginal Probe

Multi-frequency 10, 8 & 6 MHz were used. Transvaginal ultrasound is performed very much like a gynecologic exam and involves the insertion of the transducer into the vagina after the patient empties her bladder. The tip of the transducer is smaller than the standard speculum used when performing a Pap test. A protective cover is placed over the transducer, lubricated with a small amount of gel, and then inserted into the vagina. Only two to three inches of the transducer end are inserted into the vagina. The images are obtained from different orientations to get the best views of the uterus and ovaries. Transvaginal ultrasound is usually performed with the patient lying on her back, possibly with her feet in stirrups similar to a gynecologic exam.

Ultrasound Gel

Ultrasound gel is a type of conductive medium that is used in ultrasound diagnostic techniques and treatment therapies. It is placed on the patient's skin at the beginning of the ultrasound examination or therapy. Ultrasound gel is typically clear and thick, but not uncomfortably sticky. When it is applied to the skin, it doesn't dribble or drip off.

Method

The study sample consisted of 200 patients 100 patients recognized as threatened abortion women while the other 100 were pregnant women with no complication. The study included patients with following criteria: age 18-45, previous consecutive abortions, gestational age calculated from first day of the last menstrual period between 6-13 weeks, visible intrauterine GS with a living embryo, vaginal bleeding in the preceding 24 hours and singleton pregnancy.

Transvaginal Doppler scanning

Transvaginal ultrasound is performed very much like a gynecologic exam and involves the insertion of the transducer into the vagina after the patient empties her bladder. The tip of the transducer is smaller than the standard speculum used when performing a pap test. A protective cover is placed over the transducer, lubricated with a small amount of gel, and then inserted into the vagina. Only two to three inches of the transducer end are inserted into the vagina. The images are obtained from different orientations to get the best views of the uterus and ovaries. Transvaginal ultrasound is usually performed with the patient lying on her back, possibly with her feet in stirrups similar to a gynecologic exam. The endovaginal probe was inserted gently into the vagina and the uterus and adnexal region were scanned, the intrauterine gestational sac and embryo were identified and, the size of GS was calculated to confirm gestational age. Yolk sac was identified.

The imaging portion of the examination was directed towards the uterus to evaluate any intrauterine contents, Sagittal and transverse images of the uterus were obtained, and dimensions of any uterine contents were measured by using sagittal images. Endometrial thickness was measured, after taking the measures of uterine contents. After embryo viability was confirmed, the color aiming was activated to identify the vessels under study .The uteroplacental circulation was assessed, the uterine arteries localized as they approach the lateral uterine wall at the level of internal os in the transverse plane. Once the vessels identified, pulsed Doppler was activated to obtain the flow velocity waveform from the vessels. The insonation angle was kept at < 30 degrees for assessment of uterine arteries. Then the image was frozen including at least three waveform signals. The three velocity indices: Pulsatility index (PI) Resistance index (RI), peak systolic velocity (PSV) was automatically calculated for uterine artery. In each patient, the PSV, RI, PI from left and right uterine arteries were averaged and used for statistical analysis.

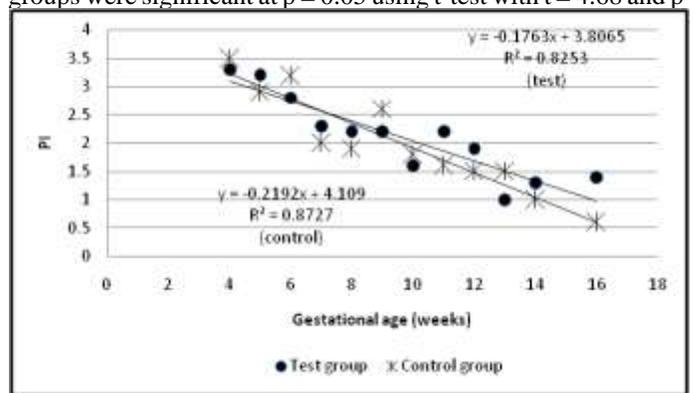
RESULTS

The result of this study showed that there is an inverse linear proportionality between the PI, RI and the gestational age for threaten abortion groups as well as control group (Figure 1(A&B)). Where the PI decreases by 0.22 unit/week for threaten abortion group and by 0.17 unit/week for threaten abortion one. This result relatively is in favor of control group where plausibility increase with the increases in gestational age i.e. more blood flow to the fetus. Similarly the resistive index

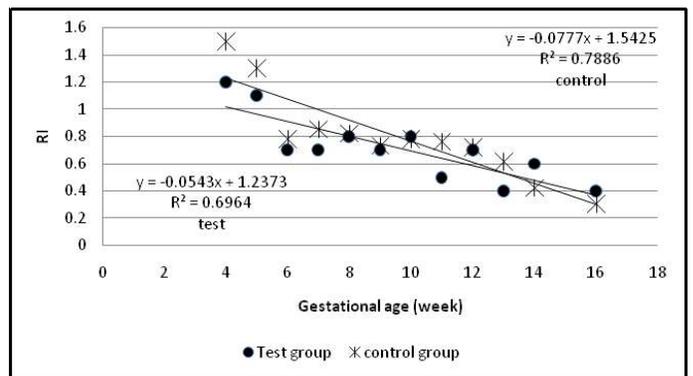
decreases by 0.08 unit/week for control group and by 0.05 unit/week also in favor of control groups. Therefore resistivity of blood flow in threaten abortion relatively more than that of the control group; although the difference between the control and threaten abortion group in case of PI and RI at p = 0.05 using t-test was inconclusive with t = 0.87 and 1.9 respectively and p = 0.41 and 0.08 respectively.

Figure 1 scatter plot show the mean values of blood follow indices of pregnant women with threaten abortion (test group) and healthy pregnant women (control group) versus gestational age, where (A) display the PI of the two groups versus gestational age. Similarly (B) and (C) displayed the relationship of RI and PSV respectively with gestational age

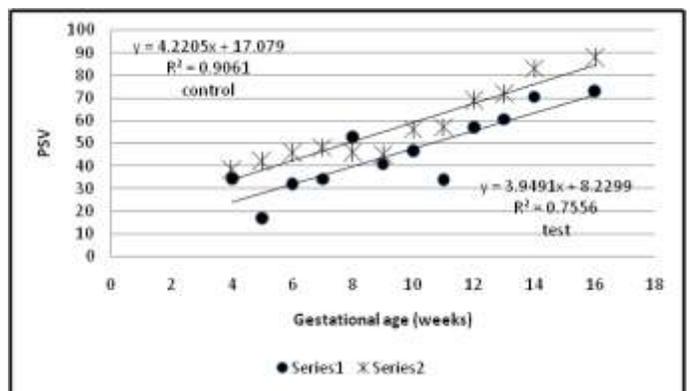
The blood flow index depicted a direct linear relationship with gestational age; where the blood flow increases by 4.2 unit/week for control group and by 3.9 unit/week for threaten abortion group (figure 1(C)). Also here the result is in favor of the control group; where the difference between the two groups were significant at p = 0.05 using t-test with t = 4.68 and p



(A)



(B)



(C)

= 0.001. therefore blood flow in case of threaten abortion is significantly lower than that of the control group; where in case of control group the PSV index start from 17 unit in case of threaten abortion starts by 8 units.

The factors that affected the blood flow in case of threaten abortion were the presence or absence of hematoma as well as the rate of loss (miscarriage) Table 1 & 2. As it was obvious the PI, RI and PSV were different when hematoma were present than not present; where it increase the resistivity of blood flow and consequently decreases the blow flow. This differences was significant at $p = 0.05$ using t-test with $t = 3.04, 6.64$ and 2.93 and $p < 0.001$.

Table 1 the mean and standard deviation of the PI, RI and PSV for threaten abortion group in respect to hematoma presence or not.

Presence of hematoma	PI	RI	PSV
Yes	2.28±0.9	0.83±0.3	42.87±28.9
No	1.69±0.8	0.46±0.2	59.7±24.7

Table 2 the mean and standard deviation of the PI, RI and PSV for threaten abortion group in respect to loss occurrences.

Loss occurrence	PI	RI	PSV
Yes	2.3±0.8	0.83±0.3	42.36±28.9
No	1.66±0.8	0.47±0.2	60.27±24.5

Similar to hematoma presence the loss also affected the blood flow indices (Table 2). Where the resistivity increases with loss occurrences and blood flow decreases. The differences in blood flow indices between the groups of losses in threaten abortion were significant at $p = 0.05$ using t –test with $t = 3.36, 6.19$ and 3.17 respectively and $p < 0.001$.

CONCLUSION

This study showed that the blood flow indices can be objectively a good a sign of threatens abortion pregnancy;

especially peak systolic velocity where it significantly differentiates between threatens abortion and normal cases. The key factors in the blood flow indices alteration is the presence of hematoma of loss occurrences. In these two conditions the blood flow indices were significant different beyond any doubt. Therefore blood flow indices can classify threaten abortion objectively especially in case of hematoma and loss.

REFERENCES

1. Regan L, Braude PR, Trembath PL. 1989. Influence of past reproductive performance on risk of spontaneous abortion, *BMJ*, 299:541.
2. Ball RH, Ade CM, Schoenberg JA, Crane JP.(1996) : The clinical significance ultra-sonographically detected subchorionic hemorrhages. *Am J Obstetric Gynecology*, 174:996.
3. Nyberg DA, Filly RA, Filho DL. 1992. Threatened abortion: Sonographic distinction of normal and abnormal gestation. *Med J.*, 304:867-869.
4. Goswamy RK, Williams G. and Steptoe PC. 1988. Decreased uterine perfusion a cause of infertility. *Hum. Reprod.*, 3: 955–959.
5. Evans DH, Medicken WN, Skidmore R and Woodcock JP. 1989. Doppler ultrasound physics, instrumentation and clinical applications. Chichester; Wiley.
6. Tekay A, Martikainen H, and Jouppila P. 1996. The clinical value of transvaginal color Doppler ultrasound in assisted reproductive technology procedures *Hum. Report*, 11: 1589–1591.
7. Sieroszewski P, Suzin J, Bernaschek G, and Deutinger J. 2001. Evaluation of first trimester pregnancy in cases of threatened abortion by means of Doppler sonography. *Ultraschall Med*, 22: 208–212.