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Fetal heart rate pattern reflecting the severity of placental abruption

Farnaz Sahaf Ebrahimi*, Shamsi Abbasalizadeh and Fatemeh Abbasalizadeh

Women's Reproductive Health Research Center, Faculty of Medicine, Tabriz University of medical sciences, Tabriz, Iran

*Corresponding author

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A B S T R A C T

Placental abruption was occurred in 1-5% of pregnancies and its prevalence is increasing. Placental abruption is an important cause of maternal and neonatal mortality. Fetal heart monitoring is not only an appropriate method for diagnosis but may also indicate disease intensity. The aim of this study was evaluation the fetal heart rate pattern and associated with placenta abruption intensity. In a cross sectional and descriptive analytical study that perform in Department of Obstetrics & Gynecology of Tabriz University of Medical Sciences on patients with Placental abruption, the fetal heart rate pattern and associated with abruption placenta intensity evaluated. The mean age of patients was 29.73 ± 7.16 years. The mean of gravidity, parity and previous abortion in patients were 1.8 ± 7.11 , 0.67 ± 0.97 and 0.16 ± 0.42 , respectively. 55%, 49% and 20% of patients had acceleration in 10, 20 and 40 minute, respectively. 49%, 45% and 32% of patients had deceleration in 10, 20 and 40 minute, respectively. Prolonged Bradicardia in 18% of mothers and prolonged tachycardia was found in 16% of mothers. Mean of placenta abruption intensity in the studied patients was 33.50 ± 20.33 percent. Mean first and fifth minute Apgar scores in the studied patients was, 6.99 ± 2.58 and 8.49 ± 2.43 , respectively. Mean of fetal umbilical artery PH in the studied patients was 7.23 ± 0.14 . Mean of fetal umbilical artery BE in the studied patients was -6.09 ± 6.21 . Mean Base Line of fetal heart rate in the studied patients was 136.03 ± 27.80 . Significant correlation was not found between FHR patterns with placenta abruption intensity, 1 and 5 minute Apgar scores and fetal umbilical artery PH. Mean of Deceleration count in 10 and 20 minutes was significantly lower in patients with a term pregnancy. A patient with Prolonged Bradicardia, the number of Acceleration and Deceleration in 40 minutes was significantly lower and the number Acceleration count in 10 minutes was significantly higher.

Introduction

Placental avulsion is a pathological condition in which a part of placenta is

separated from uterine bed prematurely (Scott, 2005). This is due to gathering some

underlying pathologic processes which can be as an effect of accelerator events (such as premature membrane rupture) or chronic placental vascular insufficiency (Shen, 2008).

Placental avulsion occurs in 0.5–1% of pregnancies and its prevalence is increasing. It is one of the important causes of maternal and neonatal mortality (Kayania, 2003). It is the cause of 10 -15 % of prenatal mortalities (Scott, 2005).

Placental Avulsion usually is diagnosis clinically based on patients' symptoms such as vaginal bleeding, uterine pain, uterine tetanic contractions and abnormalities of fetal heart rate (FHR) (Kayania, 2003). Bleeding occurs in 80% and other symptoms occur in 20 percent of cases. Abdominal sonography is used for further diagnosis (Usui, 2008).

Fetal heart monitoring is a useful method for the diagnosis of the disease (Odendaal, 1988) It may also indicate the severity of disease because when placental avulsion occurs as the fetus is separated from the oxygen source (Matsuda, 2005), as a result acidosis occurs in different levels and different patterns of fetal heart rate can be seen upon severity of placental detachment (Matsuda, 2005).

Since fetal heart rate monitoring is one of available methods for assessing the fetus in the labor, it would be very beneficial if we can find specific patterns of the fetal heart rate in sever placental detachment. And since, there is not done many studies in this topic and with regard to the increasing prevalence of placental detachment, and its mortality. We are going to respond to these 2 questions specifically:

At first, which patterns of fetal heart rate were occurred in severe placental detachment as an indicator of detachment severity?

At second, is there any cases in which there is a normal fetal heart rate despite placental detachment and if existing is there any association with severity of detachment?

The severity of placental avulsion will be studied by its effect on neonate and newborn and not upon its maternal effects that can assess the worst patterns of FHR in relation with fetus and neonate.

Methods and Materials

In a cross sectional analytic descriptive study in Tabriz Al-Zahra hospital on patients with placental detachment we evaluated the relation between different patterns of fetal heart rate with different severities of placental detachment.

With studying the placenta after the labor, we selected the women with placental detachment and assessed the severity of the avulsion with fetal and maternal parameters:

The severity of placenta detachment determine by the fifth minute Apgar, Ph of umbilical artery and the percent of placental detachment which is seen in placental examination after the labor.

The umbilical cord blood is taken immediately after placental exit and its PH was determined. The placental heart rate pattern was evaluated upon (NICHD) criteria which are indicated below:

- i. Bradicardia: baseline FHR less than 110 beat per minute

- ii. Tachycardia: baseline FHR more than 160 beat per minute
- iii. The less of beat to beat changes: FHR which is not changeable
- iv. Reduce in beat to beat change: FHR with changeability less than 5 beats
- v. Number of Acceleration in 10 minute
- vi. Number of acceleration in 20 minute
- vii. Number of acceleration in 40 minute
- viii. Number of deceleration in 10 minute
- ix. Number of deceleration in 20 minute
- x. Number of deceleration in 40 minute
- xi. Prolonged bradycardia
- xii. Prolonged tachycardia

We evaluated that is there a relationship in FHR pattern with different situations shown below or not:

- 1-5th minute Apgar 7.1> or ≥ 7.1
- 2- PH of umbilical artery: ≥ 7.1 and $7.1 >$
- 3-placental detachment: $>75\%$, $50-74\%$, $25-49\%$ - 25% >

We used a checklist which included demographic characteristics of patients and all needed information in patient files. The patients were selected randomly until completing the enough cases for the survey.

From 2010 to 2011 we studied all women which placental detachment was proved macroscopically for them and did not achieve the exclusion criteria such as fetal congenital anomalies, accidental placental

detachment found in pathologic studies, all mothers with gestational age below 20 weeks and more than 44 weeks

Ethical considerations

With regarding to the fact that no intervention was performed on patients there was no need for ethical consent. All data from patient was confidential and no name or address of patients was mentioned.

Statistical analysis of data

All data from patients was analyzed by means of descriptive analytic studies(frequency, percent, mean standard deviation)the mean difference tests for independent groups, chi square test and regression model is used upon request with SPSS ver.15 analytic software. The p value considered significant less that 0.05.

Results and Discussion

Mean age of mothers was 29.73 ± 7.16 year. Mean Gravidity and parity of patients were 1.8 ± 2.11 and 0.67 ± 0.97 ; respectively. Mean of decolman severity in patients was 33.50 ± 20.33 percent. Correlation between FHR pattern and placental detachment severity were shown in Table 1. Mean of 1^{sh} And 5th Apgar of neonates were 6.99 ± 2.58 and 8.49 ± 2.43 , respectively. Correlation between FHR pattern and 1st and 5th minute Apgar were shown in Table 2.

Mean of PH and BE Umbilical artery were 7.23 ± 0.14 and -6.09 ± 6.21 , respectively. Correlation between FHR patterns and Umbilical artery PH were shown in Table 3. Mean of systolic and diastolic blood pressure in patients were 119.95 ± 25.54 and 74.04 ± 14.35 , respectively. Mean base line of fetal heart rate was 136.03 ± 27.80 .

Correlation between Decolman severity, 1st minute Apgar and 5th minute Apgar with Prolonged Bradicardia and Prolonged tachycardia were shown in Table 4.

Placental detachment is one the complications of the pregnancy which occurs in 1-2% of labors and is one of the maternal and fetal mortality and morbidity causes (Hladky, 2002).

Fetal heart rate recording is used for 3 decades as an acceptable diagnostic procedure (Weiner, 1997). The main cause of FHR monitoring is to diagnose asphyxia in its first steps and to intervene for preventing neurologic complications and fetal death (Kafui and Ray, 2002) the clinical use of tests before the delivery is associated with decreased mortality and morbidity.

NST is a standard way for pre labor assessment in many obstetric centers worldwide because of its simplicity and not having contraindication (Benedict, 2001; Cunningham, 1997).

Rie Usui and colleagues in 2007 have conducted a study on 40 Japanese women with placental detachment, demonstrate that 80% of neonates had abnormal FHR pattern (Usui, 2008).

Salma Imran Keyani and colleague in 2003 have assessed 32 women with placental detachment which delivery was done for them because of the fetal Bradicardia. They evaluated the outcome of labor and concluded that in 11 cases the outcome was poor (8 dead newborns, 3 cerebral pulsed newborns) the result was desirable in 22 other deliveries (Kayania, 2003).

In a study by Matsuda and his colleague in 2005, they evaluated the fetal outcome of placental detachment and assessed the

contributing factors in placental detachment. These factors include using sonography and FHR. They studied 50 cases of placental detachment with delivery in 26 to 28 weeks results showed 8 dead neonates and 11 poor delivery outcomes (Matsuda, 2005).

In our study 7% of neonates was dead or died immediately after the delivery.

Tikkanen and his colleague conducted a study in 2006 and evaluated the clinical presentations and risk factors of placental detachment. They studied 198 women with placental detachment and 396 women as control group between 46742 women who had been admitted in hospital from 1997 till 2001. They showed that Fetal heart rate abnormalities(69%),vaginal bleeding(70%),abdominal pain(51%)and bloody amniotic fluid(50%) was the most common clinical presentations(Tikkanen, 2006).

In 1988 Odendaal and et al studied the relation of fetal heart rate monitoring and early diagnosis of the placental detachment. They studied 132 women with severe preeclampsia which there was placental detachment in 16 of them (Matsuda, 2005).

4 of them had a abnormal FHR and all 16 had low Apgar scores (Odendaal, 1988).

Pariente and et al conducted a study in 2011 and stated that there is a higher rate of caesarian delivery in pregnancies with placental detachment (Pariente, 2011).

Similar to above studies in our study 77% of deliveries was with cesarean and remaining 23% was with vaginal delivery, there is a higher rate of cesarean delivery in presence of placental detachment.

Pariente and his colleague stated that placental detachment is associated with higher mortality and Apgar below 7 in 5 and 1 minute after birth (Pariente, 2011).

In our study there was below 7 Apgar of 1st minute in 28% of patients and below 7 Apgar of 5th minute in 15% of patients.

In a study by Bibi and his colleague in Pakistan, they stated that 63% of mothers with placental detachment are between 20 – 35 years of old (Bibi, 2009).

Similar to the study above, in our study 6% of patients were younger than 20 years, 70% was in range of 20 to 35 years and 24% was older than 35 years.

Bibi et al have stated that fetal mortality in cases of placental detachment is about 5% (Bibi, 2009) similar to these findings the mortality of cases of our study is about 7%.

In another study by Hossain in 2010 in Poscot, they stated that 54% of women with placental detachment had a parity of 2, 3 or 4 (Hossain, 2010).

In our study in contrast to mentioned studies most of women with placental detachment was nulliparous and only 16% of them has 2 or more parity. In a study by Abu-Heija and colleague they stated that high parity, preeclampsia and hypertension are of common causes of placental detachment (Abu-Heija, 1998). In our study in 18% the systolic blood pressure was above 140 and diastolic blood pressure was above 90.

In another study by Pitaphrom and colleague in gynecology and obstetrics department of Chulalouhorn university of Thailand in 2006, with studying the pregnancy outcomes with placental detachment, they stated that

preterm birth was in 56.3%, sever asphyxia in 16% prenatal death was in 16.5 % (Pitaphrom and Sukcharoen, 2006).

In another study by Tikkanen and colleague in gynecology and obstetrics department of Helsinki university of Finland in 2011 they stated that 105 of preterm labors and 10 - 20% of prenatal deaths is due to placental detachment (Tikkanen, 2011).

In study by Usui and his colleague in Japan in 2008, the studied the FHR pattern in pregnancies with placental detachment, they showed that 80% of placental detachment cases had abnormal FHR, the fetal bradycardia was a common finding in cases with Apgar under 7 and umbilical artery PH lower than 7.1, and normal FHR was associated with Apgar more than 7 and PH more than 7.1 (Usui, 2008).

In our study there was prolonged bradycardia in 175 of studied patients and prolonged tachycardia was present in 16% of patients Deceleration in 10 and 20 minutes was significantly lower in term pregnancies. In patients with prolonged bradycardia the accelerations in 40 minutes was significantly lower and decelerations in 10 minutes was significantly more.

Conclusion

The mean age of patients was 29.73 ± 7.16 years. The mean gravid, parity and past abortions was 1.8 ± 7.11 , 0.67 ± 0.97 and 0.16 ± 0.42 respectively. 55%, 49% and 205 of patients had acceleration in 10, 20 and 40 minutes. 49%, 45% and 32% of patients had decelerations in 10, 20 and 40 minutes respectively. Prolonged bradycardia was present in 18% of patients and prolonged tachycardia was present in 16% of patients.

Table.1 Correlation between FHR pattern and placental detachment severity

		Detachment severity				P
		<25%	25-50%	50-75%	>75%	
Acceleration count in 20 min	1	34	34	16	3	0.569
	3	6	7	1	1	
	4	3	4	1	0	
	5	1	1	1	0	
	6	0	1	0	0	
Acceleration count in 40 min	0-2	29	38	19	4	0.119
	3	0	4	1	0	
	4	1	1	0	0	
	5	1	1	0	1	
	8	0	1	2	0	
Deceleration count in 20 min	0-2	8	15	4	1	0.813
	3	1	4	3	9	
	4	2	2	0	0	
	5	1	1	1	0	
	8	1	1	0	0	
Deceleration count in 40 min	0-2	32	34	18	3	0.980
	3	2	2	0	1	
	4	1	2	0	0	
	5	0	3	1	0	
	8	1	0	0	0	
Prolonged Bradicardia	-	28	34	18	2	0.455
	+	8	7	1	2	
Prolonged tachycardia	-	32	35	14	3	0.156
	+	4	6	5	1	
Bit to Bit Variability	-	28	34	17	3	0.826
	+	7	7	2	1	

Table.2 Correlation between FHR pattern and 1st and 5th minute Apgar

		1 st minute Apgar			5 th minute Apgar		
		<7	>=7	P	<7	>=7	P
Acceleration count in 20 minutes	1	23	50		12	61	0.620
	3	2	13	0.253	1	14	
	4	2	6		1	7	
	5	0	3		0	3	
	6	1	0		1	0	
Acceleration count in 40 minutes	0-2	26	61		0.270	14	73
	3	1	4	0		5	
	4	0	2	0		2	
	5	1	2	1		2	
	8	0	3	0		3	
Deceleration count in 20 minutes	0-2	24	69	0.557	12	71	0.825
	3	3	5		2	6	
	4	1	3		1	3	
	5	0	3		0	3	
	8	0	2		0	2	

Deceleration count in 20 minutes	0-2	24	63		12	75	
	3	2	3		2	3	
	4	0	3	0.823	0	3	0.428
	5	2	2		1	3	
	8	0	1		0	1	
Prolonged Bradicardia	-	24	58	0.457	13	69	0.456
	+	4	14		2	16	
Prolonged tachycardia	-	22	62	0.373	11	73	0.253
	+	6	10		4	12	
Bit to Bit Variability	-	21	62	0.236	10	73	0.127
	+	7	10		5	12	

Table.3 Correlation between FHR patterns and Umbilical artery PH

	Umbilical artery PH			P
	<7.1	>= 7.1		
Acceleration count in 20 min	1	9	16	
	3	0	6	0.22
	4	1	2	7
	5	0	1	
	6	0	1	
Acceleration count in 40 min	0-2	9	23	
	3	0	3	0.98
	4	1	0	6
	5	7	22	
	8	1	2	
Deceleration count in 20 min	0-2	0	2	
	3	2	0	0.45
	4	9	23	4
	5	0	2	
	8	0	1	
Deceleration count in 20 min	0-2	1	0	
	3	9	19	0.98
	4	1	7	6
	5	10	21	
	8	0	5	
Prolonged Bradicardia	-	10	20	0.29
	+	0	6	7
Prolonged tachycardia	-	9	16	0.29
	+	0	6	3
Bit to Bit Variability	-	1	2	0.15
	+	0	1	7

Table.4 Correlation between Decolman severity, 1sh minute Apgar and 5th minute Apgar with Prolonged Bradicardia and Prolonged tachycardia

	Prolonged Bradicardia		P	Prolonged tachycardia		P
	-	+		-	+	
Decolman severity	33.07±18.43	35.59±28.0 6	0.643	32.14±19.5 9	40.63±22.6 5	0.125
1 th minute Apgar	6.93±2.55	7.29±2.80	0.523	7.08±2.58	6.50±2.63	0.411
5 th minute Apgar	8.45±2.40	8.71±2.69	0.691	8.60±2.40	7.94±2.64	0.325

The mean Apgar in 1st and 5th minute was 6.99±2.58 and 8.49±2.43. The mean PH of umbilical artery was 7.23±0.14. The mean BE of newborn umbilical artery was -6.09±6.21. The mean baseline of fetal heart rate was 136.03±27.80. There was not a meaningful relation between FHR pattern with severity of detachment, first and 5th minute Apgar and PH of neonate's umbilical artery. The number of deceleration in minute 10 and 20 of patients with term pregnancy was significantly lower. In patients with prolonged bradycardia the accelerations in minute 40 was significantly lower and the number of decelerations in minute 10 was significantly higher.

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