Research Article

Some Anatomical Changes in Placenta In Relation To Newborn`s Apgar score

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Abstract

Background: Sick newborns from apparently normal mothers, typically, have low Apgar scores and at such situation; there are great probabilities, for these newborns to develop several diseases, with poor outcomes. Also, there may be a chance for any prospect baby, to get same health state.

Objective: This study was designed to correlate some of the placental topographic anatomical data with the newborn wellbeing, and to lay highlighting, on the presence of any placental abnormality, which could be caused by neither maternal nor fetal factors.

Materials and methods: the study included 60 full term placentae of apparently normal mothers, who were admitted to Labor Room at al-Yarmook Teaching Hospital, al-Elwia Maternity Teaching Hospital and al-Khadhra`a Private Hospital, in Baghdad, for a normal vaginal delivery, or even for a caesarian section. The research was done over the period of 1st of February 2013 till end of 15th of April 2013. The newborns were scored high and low in Apgar score. The following anatomical data were selected in this study: the placental weight /newborn weight ratio, the mode of the umbilical cord insertion and the placental thickness, in each of the low and high Apgar score groups of fetuses, as indicators for the functional status of the placenta in these two groups.

Results: The placental/newborn weight ratio in low Apgar score group of fetuses, was significantly lower than that in the high Apgar score ones. As regarding the umbilical cord mode of insertion; the eccentric type of insertion was more in both of fetal groups, nevertheless it was relatively higher in the high Apgar score group of fetuses, while the central type was more in the low Apgar score group of fetuses. The marginal type was only seen at the low Apgar score group of fetuses. The mean of thickness of placentae of low Apgar score group, was found to be less than that of the high Apgar score group,

Conclusions:

There was a strong and significant correlation between the fetal well being and data obtained from these topographic anatomical placental records.

Key words: ***Placental weight / newborn`s weight ratio, placental thickness, umbilical cord insertion, Apgar score***

INTRODUCTION

Placenta is a transitory organ required for the development of embryo and fetus. Normal fetal growth and survival depends on the proper development and function of the Placenta, which serves to maintain a feto-maternal interference for the exchange of blood gases, nutrients, waste...etc [1&2].

After delivery it can also serve as an ***experimental animal*** for an extensive variety of studies [3]. It is the only known organ to develop in adulthood period, plus, is the only one with a defined end date [4].

Placental development has a highly adaptable experience, and many types of compensations, are usually, possible, to stand any suboptimal nutritional category [5].

Anatomically; the almost immediately expelled placenta has roughly a compressed discoid shape, with an approximately circular or ovoid profile. The contour of the placenta is considered to be manipulated, by the

place of its implantation, within the uterus [1&4]. The normal full term placenta has an average weight of about 200– 800 g. It is thickest at its centre, which is the primary embryonic pole, and rapidly, taper in thickness towards its margin, where it goes on with the chorion leave [2].

The placenta, as a rule, has two surfaces; the fetal and the maternal surfaces. The fetal one is smooth, glossy and transparent. The mottled look of the subjacent chorion, to which it is directly applied, can be noticed through it. An abundance of large arteries and veins named the chorionic vessels, meet towards the umbilical cord, at the chorionic plate. Also the amnion is normally, cover the chorion.

The attachment of the umbilical cord is classically eccentric, and to a less extent central, with a rare variety of being marginal. Nevertheless, the umbilical cord, occasionally, is inserted into the chorionic membranes, to the outer surface placenta and this state is known as velamentous cord insertion [6 & 7].

The branches of the umbilical vessels are given out beneath the amnion, from the position of cord insertion; the veins are deeper and bigger than the arteries.

Quite the reverse, the maternal surface has maroon color, with lightly granular look and often, mapped into about 15–30 lobes; which are covered by decidua basalis. Each lobe is termed cotyledon and there are grooves separating these cotyledons, correspond to the bases of partial placental septa, which emerge from the maternal aspect of the intervillus space, but not definitely reach the chorionic plate [8, 9 & 10].

In 1952, Dr. Virginia Apgar created a ***scoring system*** which was a rapid method of evaluating the clinical status of the newborn infant within the 1st minute of life, to determine if there is a requirement for intervention, without delay to start breathing. It is a simple and repeatable technique, to a quickly and instantly review of the clinical state of a newborn, right away after birth, at the 1st minute of life. The letters of the word (Apgar) refers to the five criteria, which are, typically, obtained from the immediate examination of the newborn and give the words chosen to form an acronym (**A**ppearance, **P**ulse, **G**rimace, **A**ctivity, and **R**espiration). Each of which is given a score of 0, 1, or 2, afterward, summing up the five data, to give a score range from zero to 10.The score is typically, reported at 1st and 5th minutes after birth. Results of preceding authors confirmed that; Apgar score is useful, to expect the postnatal outcomes, for instance, neonatal respiratory distress, any need for orotracheal intubation any need for Neonate Intensive Care Unite admission and hypoxic-ischemic-encephalopathy and so on. Other authors illustrated, conversely, that Apgar score in 5th minutes has a poorer judge of long-term neurological outcome [11, 12, 13 & 14].

The aim of this study was planned to correlate the placental anatomy with the neonatal Apgar score in human, because despite years of so many studies on the placental milieu, it is still a context of great interest.

PATIENTS AND METHODS

A sum of sixty placentae was used in the ongoing study after taking a verbal legal consent from the included patients. These placentae were collected from healthy, full term, non-smoker women who had a normal and non-obstructed vaginal delivery or Caesarian Sections which were indicated for non-fetal distress causes. Those mothers were admitted to the obstetric ward of al-Yarmook Teaching Hospital, al-Elwia Maternity Teaching Hospital and al-Khadhra`a Private Hospital, in Baghdad. The research was done over the period of 1st of February 2013 till end of 15th of April 2013. The gestational age was determined by an early ultrasound examination, with the aid of the history taken as a routine from those women, at the labour room, to ensure a full term pregnancy, which was measured as about 40±2 weeks, from the first day of the last menstrual period, or 38 weeks from the assumed day of fertilization, which is usually, determined by the ultrasound examination, at the mid-cycle time. Weights of the newborns were measured by weight scale (ultra-scale mbsc-55 Digital Baby Pet Scale) in milligrams. The Apgar score at the 1st minute was counted, for each newborn within this study, either by a pediatrician or by an anesthetist .

After being expelled, the placental membranes were trimmed off and the umbilical cord incised, to extent about 2 cm from its insertion. The placentae were grossly checked up, immediately, after being washed by a normal saline solution, to remove any blood clots and blotted dry, then, weighed by a weight scale (Ozeri Pronto) in exact milligrams and the placental weight/newborn`s weight ratio was taken. Then the placental thickness was calculated in cm. It was measured by introducing a fine needle, from the chorionic plate to the basilar plate, then; the introduced part of the needle was measured by a standard measuring tape. The point of introducing the needle was chosen at midpoint of the longest width of the placenta extending from the site of the cord insertion to the periphery.

Statistical analysis was done, using data values; which were stated as the means, with the Standard deviation and Standard Error; to find any significant differences. The significant differences were evaluated, by using the Pearson Chi-square test and Students t–test were used to compare between the means of each variable in relation to the grouping variable which was the Apgar score, The P values of less than 0.05 were regarded as a significant one and less than 0.001 were regarded as a highly significant [15].

A grouping variable, here, was the level of Apgar score, which was considered high (normal) scores, when it was above or equal to seven (≥ 7), while the low Apgar scores were the values below seven (<7).The statistical analysis of data was done, by using the Predictive Analysis Software (PASW) version 18.0, which was setup in a personal computer.

RESULT

The data obtained from this study showed a significant decrease in the weight ratio (weight of Placenta/ weight of newborn) in newborns with low Apgar scores as compared to newborns with high scores as shown in table 1and figure1.

The mean of thickness of placentae of low Apgar score group, was found to be significantly less, than that of the high Apgar score group, and highlighted at the table 2 and figure 2.

The umbilical cord eccentric insertion was the principal type, in both Apgar groups, and it was relatively higher in the newborns with high Apgar score, while the central type was much less in both Apgar groups, but it was relatively more in the low Apgar score group of newborns, than that of the high Apgar group. The marginal type of insertion was the least and it was only seen at the low Apgar score group, which was detected at the table 3.

Table 1: placental weight in milligrams / newborn`s weight in milligrams; in low Apgar score group and in high Apgar score group

Placental wt / newborn`s wt ratio	wt in mg Low Apgar score <7	wt in mg High Apgar score =>7
Mean±SD	0.14±0.03	0.16±0.04
Standard Error of Mean	0.005	0.007
Mode	0.110	0.130
Range	0.103-0.186	0.110-0.247
Percentile 05th	0.103	0.113
25th	0.112	0.136
50th (Median)	0.125	0.154
75th	0.168	0.200
95th	0.183	0.226
99th	0.186	0.247
P value	0.002*	

***Significant using Students-t-test for difference between two independent means at 0.05 level.**

Table 2: thickness of placenta in cm; in low Apgar score group and in high Apgar score group

Thickness of placenta in cm	Low Apgar score <7	High Apgar score =>7
Mean±SD	2.55±0.52	2.95±0.42
Standard Error of Mean	0.095	0.077
Mode	3.00	3.00
Range	1.80-3.80	1.80-3.80
Percentile 05th	1.80	1.80
25th	2.00	2.80
50th (Median)	2.70	3.00
75th	3.00	3.20
95th	3.10	3.50
99th	3.80	3.60
P value	0.002*	

***Significant using Students-t-test for difference between two independent means at 0.05 level.**

Table 3 umbilical cord attachment in low and high scores:

		Low Apgar score <7		High Apgar score =>7		P value
		No	%	No	%	
Umbilical cord attachment	Central	10	33.3	9	30.0	0.319
	Eccentric	18	60.0	21	70.0	
	Marginal	2	6.7	-	-	
	Velamentous	-	-	-	-	

***Significant using Pearson Chi-square test at 0.05 level.**

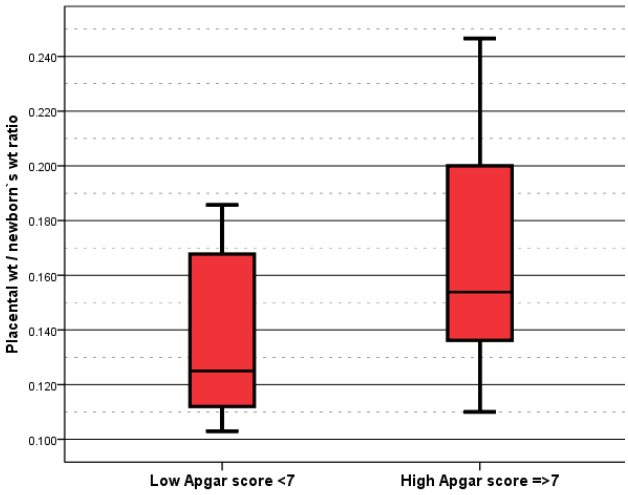

Figure 2: placental weight / newborn`s weight

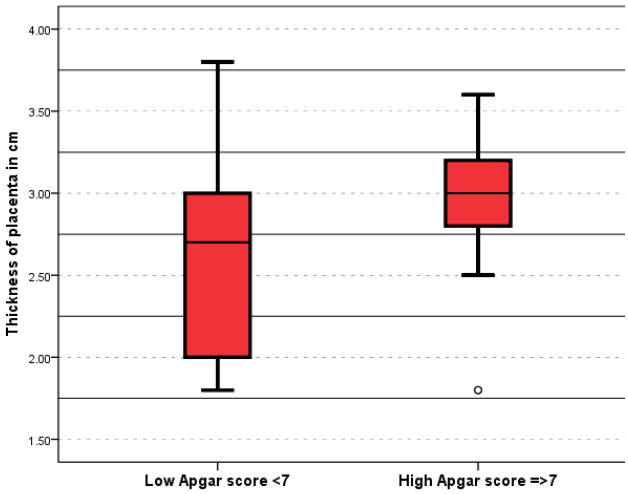

figure 2: thickness of placenta in cm

DISCUSSION

The idea of relationship between placental examination and Apgar score was emerged here, since there were no such similar previous project had been found when the available literatures were deliberated. This concept; may improve the current neonatal medical care and the future antenatal care for the next pregnancies, of the same mother, by emphasizing the importance of the anatomical examination of placenta, soon after birth, especially in infant having a low Apgar score, to diagnose any placental causes. A grouping variable, here, was the level of Apgar score, which was considered as a high (normal) score, when it was above or equal to seven (≥ 7), while the low Apgar scores were the values below seven (<7) according to Virginia, 1953[11]. The placental weight is well documented to be; inversely proportional to the fetal weight. This may be due to the compensatory mechanisms, which are involved in the enhancement in the bulk of the placenta as reported by Sastry, 1991[16]. In the current study; the weight ratio (placental weight / newborn`s weight) was lower in low Apgar scored newborns, which might be due to a poor placental function, in view of the fact that, placental hypertrophy as well as reduced fetal growth, have been postulated to be an adaptation to uphold the placental function, in a pregnant woman having unhealthy conditions, such as malnutrition, while in the normal condition; it was illustrated that the actual placental weight was lower in small for date infants, than those in appropriate gestational age infants, of the same birth weight [17 &18].

It seems that the low birth weight should be linked to a less functional placental tissue, if the pathology in the placenta itself; and this is going together, with the diminution of the exchange area between mother and fetus, both at the villi and at the fetal capillary surface area. Thus, the ability of exchanging oxygen and nutrition from the mother to the fetus is shortened [19&20].

Table 3 showed the mean measurements of thickness of placenta in low Apgar score group that was found to be significantly lower than that of the high Apgar score group. That might be clarified as follows:

The placenta reaches nearly its maximum diameter during the 1st half of pregnancy. But its thickness continues to increase, the whole time of pregnancy, via the growth of villi [21].

Ohagw *et al* study showed that the placental thickness is increased with the gestational age, in a fairly linear mode. Hence, it was suggested that the placental thickness can be used as an indicator of the gestational age [22]. Shepard *et al.* reported that; the estimated fetal weight, which is calculated by a formula having the biparietal diameter and abdominal circumference as variables, is dependent on the placental thickness [23].

Placental thickness is important to be studied, since it has a strong positive correlation with fetal head biparietal diameter. Subnormal placental thickness, for a given gestational age, may represent a sign for the intrauterine growth retardation. A reduction in the placental thickness less than 2.5 cm is usually associated with fetal intrauterine growth retardation [24 & 25].

Abnormality in the site of insertion of umbilical cord, although was not significant in the ongoing study, it could cause problems which having the potential to affect maternal and fetal health and well-being [26].

So it might be concluded that; after birth, anatomical examination of the placenta can yield important information about the immediate and later management

of mother and infant. The examination of placenta is very important as it gives a mirror images of fetal development, it reflects the intrauterine, and intra-partum events of gestation. An assessment of placental pathology is useful for resolving whichever issues come up from pregnancy complications, including perinatal loss. In case of fetal death, this type of examination of placenta is almost mandatory and the information obtained, perhaps, are useful for solving any suspected medico-legal problems

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