

VARIATIONS IN LENGTH AND DIAMETER OF UMBILICAL CORD IN HYPERTENSIVE PREGNANCIES

Anatomy

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ABSTRACT

Placenta and umbilical cord, no doubt is a matter of interest and curiosity for ages for many anatomists, embryologists and obstetricians because of its incomparable importance in the intrauterine development of human being. Placenta and umbilical cord acts as a mirror which reflects intrauterine status of fetus. It is the most accurate record of infant's prenatal experiences, so study of placenta and umbilical cord gives valuable clues in cases of adverse fetal outcome.

We compared the lengths and diameters of umbilical cords of uncomplicated pregnancies with those of pregnancies complicated by hypertension. The effect of parity on the length and diameter of umbilical cords is also noted.

We found that there is significant increase in length of umbilical cord and reduction in diameter of umbilical cord in hypertensive pregnancies than in uncomplicated pregnancies. In both the groups, as the parity increase the length and diameter of umbilical cord also increases.

Alterations in various parameters may be attributed to the effect of ischaemia produced by hypertension on the umbilical cord, subsequently affecting the foetus in the womb of mother. Appropriate precautions if instituted during pregnancy, complications of PIH can be reduced.

KEYWORDS:

Eclampsia, Ischemia, Parity, Toxemia, umbilical cord.

INTRODUCTION

Umbilical cord (funiculus umbilicalis or birth cord), no doubt is a matter of interest and curiosity for ages for many anatomists, embryologists and obstetricians because of its incomparable importance in the intrauterine development of human being. It acts as a mirror which reflects intrauterine status of fetus. It is the most accurate record of infant's prenatal experiences, so study of umbilical cord gives valuable clues in cases of adverse fetal outcome.

Umbilical cord carries nutrients, oxygen and fluids necessary for intrauterine life, so it is not surprising that umbilical cord abnormalities are associated with adverse perinatal outcome. Perinatal complications have been reported with both excessively long and short cords¹.

Hypertensive disorders complicating pregnancies or Pregnancy Induced Hypertension (PIH) are common and such hypertensive pregnancies are one of the commonest causes of maternal and foetal morbidity and mortality². Hypertensive disorders include Preeclampsia, Eclampsia and Gestational Hypertension.

Pre-eclampsia is a syndrome complex characterized by development of hypertension to the extent of 140/90 mm of Hg or more with oedema or proteinuria or both induced by pregnancy after 20th week. It is also called as toxæmia. It is more common in primigravidae (10%) than multigravidae (5%)³. Following delivery these signs disappear fairly quickly.

Eclampsia is defined as the pre-eclampsia complicated with convulsions and/or coma⁴.

Gestational hypertension is defined as sustained rise of blood pressure to 140/90 mm of Hg or more on at least two occasions 4 or more hours apart beyond 20th week of pregnancy or during the first 24 hours after delivery in a previously normotensive woman⁵.

In this study, we compared the length and diameter of umbilical cord in normal and pregnancy induced hypertension (PIH) group. Further we observed the effect of parity on length and diameter of umbilical cord.

Materials and Methods:

Overall 510 umbilical cords were included in the study, all from the full term deliveries (38-42 weeks of gestation), delivered in the department of Obstetrics and Gynecology, Government Medical College, Nagpur, India.

All cases were divided into two main groups.

Group I or Control Group:

This group comprises pregnant women without preeclampsia; women had normal blood pressure, no proteinuria and no edema and their respective umbilical cords. This group included 220 cases.

Group II or Study Group:

This group comprises hypertensive pregnancies which were diagnosed as preeclampsia, eclampsia or gestational hypertension and their respective umbilical cords. This group included 290 cases. None of these cases had hypertension prior to the pregnancy.

An inclusion criterion was according to Chesley² (1985).

The umbilical cords were collected immediately after delivery from labour rooms or operation theatres. Any gross abnormalities of the cords and membranes were noted. Length of umbilical cord was measured using measuring tape in two segments. The first segment was attached to placenta and second segment which was attached on umbilicus of newborn. Lengths of two segments were summated. Umbilical cord diameter was measured in transverse sections in two planes perpendicular to each other and mean is calculated. All these values were noted in the control group as well as in the study group and the comparison between the two groups was done.

Statistical Analysis:

Continuous variables were presented as mean standard deviation. The statistical analysis was done by using Fisher's Exact Test. $P < 0.05$ was considered as statistically significant. Data was analyzed on statistical software Graph Pad Prism 5.01.

Observations and Results:

Umbilical Cord Length:

Table I shows that mean length of umbilical cord in control group is 54.28 ± 4.21 cm. as compared to 55.89 ± 6.04 cm. in hypertensive pregnancies. The difference in mean length of umbilical cords between the two groups is statistically significant (P = 0.0008) as P < 0.05.

Table I showing Mean length of umbilical cords in cm. in both the groups according to gravidity

	Normal pregnancies (n=220)	PIH Group (n=290)	P value and Significance
Gravida 1	51.68 ± 2.28	52.05 ± 2.22	P = 0.0008 Significant (as P < 0.05)
Gravida 2	57.1 ± 2.84	58.94 ± 1.90	
Gravida 3	62.39 ± 3.91	67.16 ± 3.86	
Gravida 4 or more	---	71.92 ± 2.42	
Mean Length	54.28	55.89	
S. D.	4.21	6.04	

Moreover it is observed that in both the groups, as the parity increases, the length of the umbilical cord also goes on increasing as shown in Graph A.

Umbilical Cord Diameter:

As shown in table II, mean diameter of umbilical cord in control group is 2.46 ± 0.31 cm. as compared to 2.30 ± 0.30 cm. in hypertensive pregnancies. The difference in mean diameters between the two groups is statistically significant (P < 0.0001) as P < 0.05.

Table II showing Mean diameter of umbilical cords in cm. in the both groups according to gravidity

	Normal Pregnancies (n = 220)	Study Group (n = 290)	P value and Significance
Gravida 1	2.27 ± 0.18	2.10 ± 0.12	P < 0.0001 Significant (as P < 0.05)
Gravida 2	2.68 ± 0.27	2.51 ± 0.23	
Gravida 3	2.85 ± 0.26	2.79 ± 0.18	
Gravida 4 or more	---	2.8 ± 0.26	
Mean Diameter	2.46	2.30	
S. D.	0.31	0.30	

In both the groups, it is clear that as the gravidity increases, the diameter of the umbilical cord also goes on increasing (Graph B). It is also concluded that the umbilical cords in hypertensive group are thin and lean as compared to the normal group.

Discussion:

Umbilical Cord Length:

Rayburn WF, Beynen A and Brinkman DL⁷ (1981) recorded mean umbilical cord length in normotensive pregnancies as 55 cm (range 14 to 129 cm). Beall MH and Ross MG¹ (2009) found mean normal umbilical cord length as 55 cm (range no cord to 300 cm). Walker CW and Pye BG¹⁰ (1960) observed mean cord length as 54.1 cm in normal pregnancies. Karadeniz RS et al⁶ (2007) recorded mean umbilical cord length as 57.13 ± 9.08 cm in normal pregnancies.

In the present study, mean umbilical cord length in normal pregnancies as 54.28 ± 4.21 cm and in hypertensive group as 55.89 ± 6.04 cm. Thus umbilical cords are found lengthier in hypertensive group as compared to normal. We have not found any research material related to length of umbilical cord in hypertensive pregnancies.

Further, we recorded that in both the groups as the parity goes on increasing, the lengths of umbilical cord also go on increasing (Table No. I). Theodor et al⁸ (2003) and Torgrim S and Trygve B⁹ (1989) recorded that length of umbilical cord increases with increasing parity. The findings of our study correlate with those of above authors.

Umbilical Cord Diameter:

Karadeniz RS et al⁶ (2007) recorded mean diameter of umbilical cord in normal pregnancies as 1.5 cm. Rayburn WF, Beynen A and Brinkman DL⁷ (1981) recorded normal umbilical cord diameter up to 3 cm. Beall MH, Ross MG¹ (2009) found cord diameter as 1-2 cm. Constantin I et al (2007)³ also recorded diameter of umbilical cord in normotensive pregnancies as 1.101 cm in control and 0.80 cm in PIH group.

We observed mean cord diameter of 2.46 ± 0.31 cm in normal

pregnancies and 2.30 ± 0.30 cm in pregnancies complicated by pregnancy induced hypertension. Again it was observed that as the parity increases the diameter of the cord also increases (Table No. II).

Conclusion:

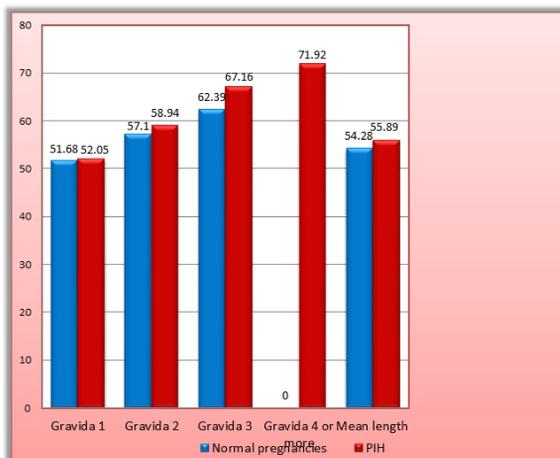
The mean length of umbilical cord in control and PIH group was 54.28± 4.21 cm and 55.89 ± 6.04 cm respectively. There is significant increase in length of umbilical cord in PIH group than in control group.

Further it is observed that in both the groups as the parity increases the length of umbilical cord also increases.

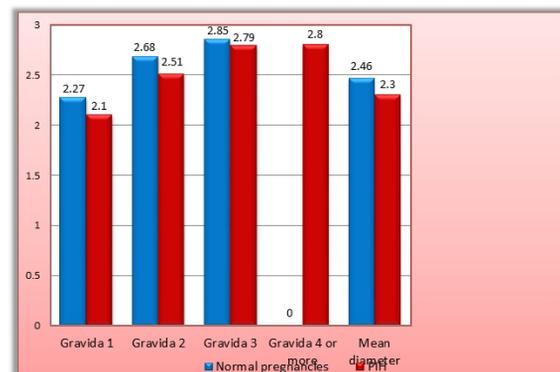
The mean diameter of umbilical cord in control and PIH group was 2.46 ± 0.31 cm and 2.30 ± 0.30 cm respectively. There is significant reduction in diameter of umbilical cord in hypertensive group than in normal. Moreover as the parity increases, the diameter also increases.

Clinically the adverse effects of hypertension on the outcome of pregnancy are well established but we have seen their gross morphological impacts on Umbilical cord. Significant changes in gross morphology have been observed in hypertensive patients. Alterations in various parameters may be attributed to the effect of ischaemia produced by hypertension on the umbilical cord, subsequently affecting the foetus in the womb of mother. Excess long umbilical cords are associated with complications like foetal entanglement, true knots, thrombi etc. So, appropriate precautions if instituted during pregnancy, complications of PIH can be reduced.

Graph A: Mean length of umbilical cords in cm. in both groups according to gravidity



Graph B: Mean diameter of umbilical cords in cm. in both groups according to gravidity.



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