

Original Articles

Morphology of Umbilical Cord in Gestational Diabetes Mellitus

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Abstract

Context: Gestational diabetes is important because of both of its high prevalence and the possible fetal and maternal complications. Gestational diabetes mellitus is well known for its disastrous impact on the fetus in terms of perinatal mortality and morbidity. It has effect on gross morphology and overall structure of umbilical cord. So, the present study was done to observe the effect of gestational diabetes mellitus on morphological structure of umbilical cord.

Materials and methods: A cross sectional, analytical type of study was carried out in the department of anatomy, Sher-E-Bangla Medical College, Barisal from June 2008 to June 2009. A total of sixty umbilical cords were collected of which thirty were from mothers having gestational diabetes mellitus and thirty were from mothers not suffering from gestational diabetes mellitus. The samples were divided into two groups as group A (control group) and group B (gestational diabetic group). The umbilical cords were examined to observe its mode of insertion to placenta. Then length and diameter of the umbilical cord were measured.

Result: In this study, mode of attachment of umbilical cord to placenta were 7(23.3%), 5(15.7%) in central attachment and 17(56.7%), 21(70.0%) in paracentral attachment in group A and group B respectively. But there were no significant difference between two study groups. The mean length and diameter of the umbilical cord was higher in gestational diabetic group but length variable did not differ significantly ($p > 0.05$) in between two study groups. The mean diameter was significantly ($p > 0.05$) higher in gestational diabetic group than the control group.

Key word: Gestational diabetes mellitus, umbilical cord, gross morphology.

Introduction

Any degree of glucose intolerance which is first detected in pregnancy is called gestational diabetes mellitus¹. The incidence of gestational diabetes mellitus in our country is 6.8% and 8.2% in fasting and 2 hours post glucose load respectively². The higher prevalence of gestational diabetes mellitus in our country may be the cause of increased mortality and morbidity of mothers and newborn³.

The umbilical cord is a long tortuous rope like structure that connects the placenta with the umbilicus of the fetus during the period of gestation

through which blood flows to and from the fetus. Thus it act as a physiological lifeline⁴. Reduced blood flow due to any morphological or pathological changes in the umbilical cord hampers proper fetal development and growth and may be associated with abnormalities or even death. Both short and long cords have been associated with an increased risk of intrapartum complications and intrauterine dangers. Shorter cords cause placental abruptions, inversion of the uterus, cord herniation and cord rupture⁵. Excessive length of umbilical cord causes fetal entanglement, nuchal cord, true knot, torsion and cord prolapse⁶. It has been documented that umbilical cord was significantly larger in fetuses of mothers with gestational diabetes than in normal population and also that the main increase in width was attributed to increase in Wharton's jelly content⁷. Umbilical cord normally inserts to the central portion of placenta^{8,9}. The umbilical cord insertion to the placenta is divided as central, paracentral, marginal and velamentous as it relates to the chorionic plate¹⁰. Marginal cord insertion (2.7%-15%), velamentous cord insertion including

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vasa previa(1.7%-11%) are susceptible to compression, torsion and rupture¹¹. So, the present study has been designed to find out any changes of gross morphological features of umbilical cord in gestational diabetes mellitus.

Materials

The study was carried out from June 2008 to June 2009 in the Department of Anatomy, Sher-E-Bangla Medical College, Barisal. Sixty human umbilical cords were selected from mothers who gave birth to a single alive baby through cesarean section during 34th to 40th weeks of gestation. Specimens were collected from Gynaecology and obstetrics department of Sher-E-Bangla Medical college and Hospital, Barisal from June 2008 to December 2008. Out of sixty umbilical cords, thirty were from mothers who were normal throughout pregnancy period and thirty were from mothers who were suffering from gestational diabetes mellitus. Mothers who were not suffering from any disease such as hypertension, eclampsia, antepartum haemorrhage was confirmed by taking history and from the hospital record sheet.

Grouping of the study sample: All the study samples were divided into following two groups:

Group A: Control group

Group B: Gestational diabetic group

Operational definitions:

Control group (Normal pregnancy):

Mother of this group had normal blood sugar level, normal blood pressure and did not have any of the exclusion criteria mentioned above.

Gestational diabetic group:

Mother of this group was non-diabetic before this pregnancy but developed hyperglycemia during the present pregnancy period.

The diagnosis of the clinical conditions and other clinical assessments of the patients were confirmed by the registered doctors of the Gynecology and Obstetrics department of Sher-E-Bangla Medical College Hospital, Barisal.

Methods

The umbilical cords were collected in a labelled plastic bags and then was brought to the Department of Anatomy, SBMC, Barisal. After clearing the specimens with the cotton, the specimens were kept on flat trays and gross parameters were studied.

1. Mode of insertion of umbilical cord in placenta:

The insertion of the umbilical cord into the placenta was examined on the fetal surface of the placenta. There were central, marginal, paracentric and velamentous insertion of the umbilical cord. Insertion of umbilical cord at the centre or within 2 cm of the center of the placenta was recorded as 'central' insertion and any insertion of the cord at the placental margin or within 2 cm of the margin was recorded as 'marginal' insertion. An insertion of the cord at any point between central and marginal points of attachment was recorded as 'paracentric' insertion. The paracentric and marginal insertions were together termed as 'eccentric' insertion¹². Velamentous is membranous insertion of umbilical cord, where cord is attached to the amnion and chorion and not to the placenta¹³. (fig-1, fig-2).

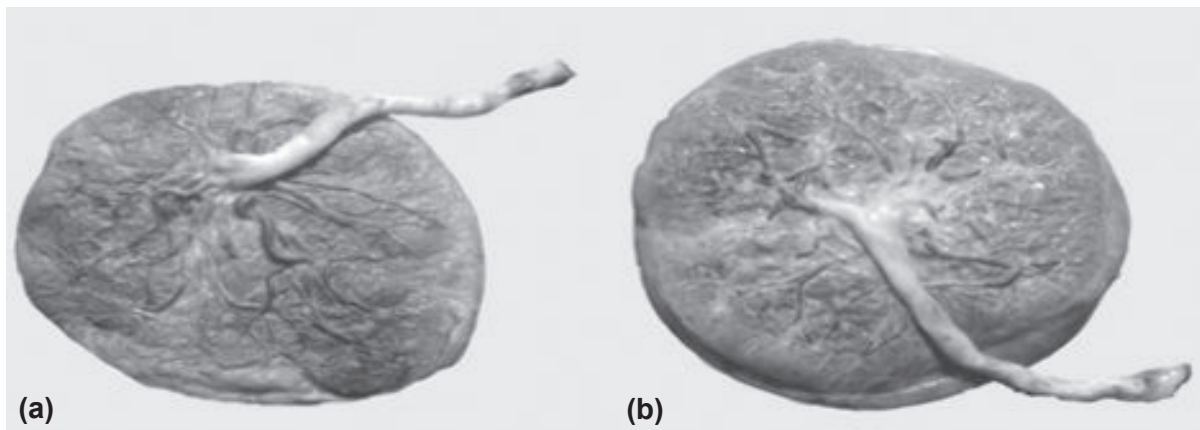


Fig.-1: Photograph showing central (a) and paracentric (b) type of umbilical cord insertion to placenta in the study groups.

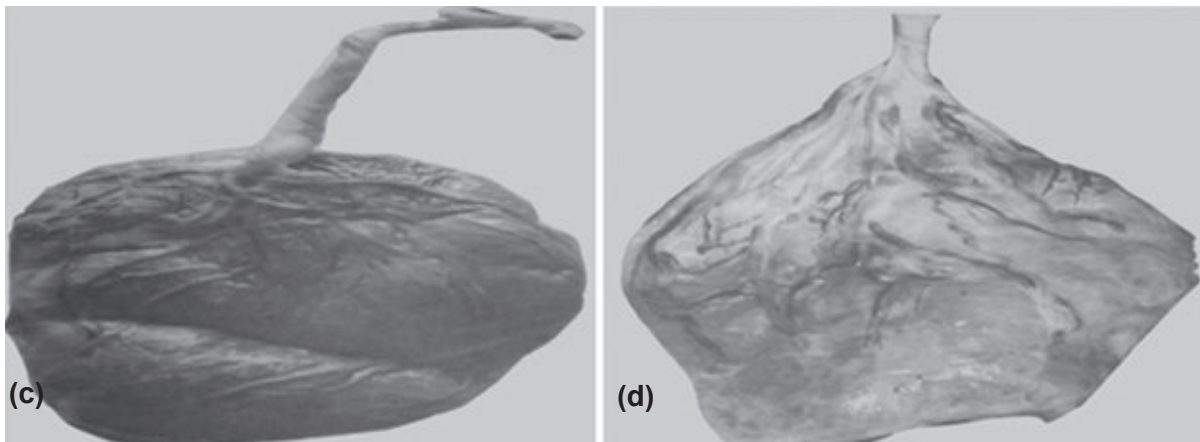


Fig.-2: Photograph showing marginal (c) and velamentous (d) type of umbilical cord insertion to placenta in the study groups

2. Procedure for measurement of length of umbilical cord:

The length of the umbilical cord was measured on a flat tray of melted wax. The umbilical cord was stretched and fixed on the tray by board pins to the placental end and cut end. Then the length was measured with a flexible metallic wire. Then the metallic wire was placed on a graduated steel scale. The segments attached to the baby and with the placenta were measured separately and the results added to get the actual length of the cord in centimeter¹⁴. (fig-3).



Fig.-3: Photograph showing measurement of length of umbilical cord by using flexible metallic wire. Arrow mark W showing metallic wire.

3. Procedure for measurement of diameter of the umbilical cord

On the cut surface of the umbilical cord, the maximum diameter was measured with a slide calipers. Then the second diameter was taken at right angles to the first one. Lastly, the mean diameter of the umbilical cord was calculated from these two measurements and expressed in centimeters (cm)¹⁴.

All data were checked and edited after collection. Later the data were put into computer and were analysed with the help of SPSS version 17.0 windows. Statistical analyses were done by unpaired Student's 't' test and Chi-square test. The difference was considered to be significant statistically at 5% level. ($p < 0.05$)

Ethical Clearance: The present study was approved by the Ethical Review Committee of Dhaka Medical College, Dhaka.

Results

1. Mode of insertion of umbilical cord to placenta:

In this study, central attachment were 7(23.3%), 5(16.7%), paracentral attachment were 17(56.7%), 21(70%) and velamentous attachment were 2(6.7%), 0(0.0%). In group A and group B respectively. Marginal attachment were found same in both groups. (fig-4).

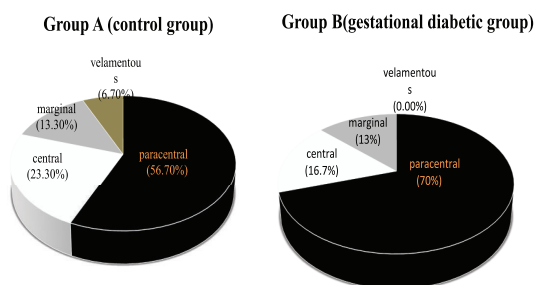


Fig 4: Pie diagram showing percentage distribution of mode of attachment of umbilical cord in two study groups.

2. Length of the umbilical cord:

In the present study the mean (\pm SD) length of the umbilical cord was 55.5 ± 10.6 cm and 60.6 ± 10.6 cm in group-A and group-B respectively. Mean difference in length of the umbilical cord between the two study groups was not statistically significant at $p > 0.05$. (Table-I , Fig- 5).

3.Diameter of the umbilical cord:

The mean (\pm SD) diameter of the umbilical cord was 1.3 ± 0.3 cm and 1.5 ± 0.4 cm in group-A and group-B respectively. Mean difference in diameter of the umbilical cord between the two study groups was statistically significant at $p > 0.05$.(Table-I, Fig-5).

Table I

Comparison of umbilical cord length and diameter of the umbilical cord between the two study groups

Group	Length of umbilical cord in cm Mean \pm SD	Diameter of umbilical cord in cm Mean \pm SD
Group A(n=30)	55.5 \pm 10.6(30-69)	1.3 \pm 0.3(0.80-1.6)
Group B(n=30)	60.6 \pm 10.6(28-73)	1.5 \pm 0.4(0.8-2)
p value	0.069 ^{ns}	0.001 ^s

Group-A =Control group

Group-B =Gestational diabetic group

Figure in parenthesis indicate range .Comparison between study groups were done by unpaired Student's 't' test. s=significant at $p < 0.05$ level, ns=not significant, n=number of study samples.

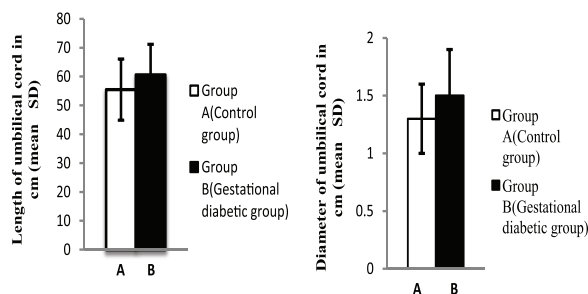


Fig-5: Bar diagram showing mean distribution of length and diameter of umbilical cord in the two study groups

Discussion

In the present study, there were no significant ($p > 0.05$) difference in the mode of attachment of umbilical cord in placenta between two study groups. In this study paracentral attachment were more (70%) in gestational diabetic group. Ahmed¹⁵ carried out a study on 20 umbilical cords with placenta of gestational diabetes mellitus and reported central attachment of all umbilical cords. According to Pathak¹⁶ cord insertion was eccentric or paracentral in gestational diabetes mellitus. Lateef¹⁷ found more (73.5%) paracentral attachment of cord to placenta in gestational diabetes mellitus. Ebbing et al¹⁸ reported 7.8% velamentous insertion of umbilical cord to placenta in single pregnancy and 16.9% in multiple pregnancy. The present study was similar with the findings of other researchers but the cause of these similarities could not be explained. In the present study, the length of umbilical cord was longer (60.6 ± 10.6) in gestational diabetic group. The results were not statistically significant ($p > 0.05$) between two study groups. Suzuki et al¹⁹ reported longer umbilical cord in gestational diabetes mellitus which was significant ($p < 0.05$). Walker and Pye²⁰ measured the lengths of the cords of 177 newborn infants. They found 46 to 79 cm long umbilical cords in 85% cases. They also reported less than 46 cm long cords in 6% cases and more than 79 cm long cords in 9% cases. They observed that the length of the cords were not influenced by the incidence of gestational diabetes mellitus. In the present study there were statistically significant ($p < 0.05$) difference of the mean (\pm SD) diameter of umbilical cord in between two study groups. Jain A et al²¹ reported greater diameter of the umbilical cord in gestational diabetic group which was

significant ($p < 0.05$). Chakroborty²² also recorded greater diameter of the umbilical cord in gestational diabetic group. Weissman et al⁷ also found that the umbilical cord was significantly thicker in the fetus of mothers with gestational diabetes than normal mothers. Weissman⁷ stated that increase in the width was due to increase in the Wharton's jelly.

Conclusion

In the present study it has been found that diameter of the umbilical cord significantly increases in gestational diabetes mellitus. Large sample size are recommended for further study.

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