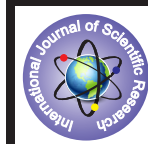


Comparative Study of Histological Changes in Umbilical Cord From Normal and PIH Patients



Anatomy

KEYWORDS : Umbilical cord, PIH

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ABSTRACT

Pregnancy Induced Hypertension (PIH) is registered as an evolutive complications of 6-12% of the pregnancies. Aim of this study is to compare the different histological changes of umbilical cord from normal and PIH patients, so as to enable the practitioners to interpret the vascular changes affecting the development of a child. The study was done on 50 umbilical cord samples, 25 samples from PIH mothers and 25 samples from normotensives mothers. The prepared Hematoxylin – Eosin stained slides were studied under light microscope. Cord's diameter (mm), cord's total area (mm²), jelly area (mm²), total vessel area (mm²), total lumen area (mm²) were studied. The diameter, the total area and total Wharton's jelly area, the total vessel area and lumen area of umbilical cord are studied and are found to be reduced in PIH group than in normal group.

Introduction

Pregnancy induced hypertension (PIH) is registered in various studies as an evolutive complication of 6-12% of the pregnancies. Etiology of PIH is still unknown.

Diagnosis of pregnancy induced hypertension is made in women whose Blood Pressure reaches 140/90 mm Hg or greater for the first time during pregnancy with or without proteinuria.

PIH represents one of the most important causes of intrauterine growth retardation, premature birth, low birth weight, perinatal mortality. PIH is associated with the increased vascular resistance and decrease in uteroplacental perfusion

Many studies have demonstrated significant differences in the morphological and histological structures of the placenta and umbilical cord vessels between normal and PIH patients.

The morphological and histological changes of the umbilical cord in PIH represent a marker of the some important postnatal and fetal hemodynamic deficiencies. A good quantification of the Histological and morphological changes of the umbilical cord in PIH provides an informational support to the practitioners concerning the baby's neurological development.

Aim and objectives

Study to understand and compare the different histological features of umbilical cord from normal and pregnancy induced hypertensive patients, so as to enable the practitioners to interpret neurological development of the baby.

Material and Method

The study was done in the department of anatomy at MGM medical college, Kamothe on 50 umbilical cord samples with the written consent of the mothers.

Out of 50, 25 umbilical cord samples were from PIH and 25 samples from normotensive mothers. Samples of umbilical cord was taken 2 cm away from placental attachment. Similarly, from the fetal side cord was taken 2cm away from umbilical attachment.

Clinical characteristics and history of the two groups were noticed.

Table no.1. Clinical characteristics of normal pregnancy and PIH (mean value)

Sr. no.	Clinical Characteristics	Without PIH (n=25)	With PIH (n=25)
1.	Mother's age (years)	24	24.8
2.	Parity	1.6	3.6
3.	Birth type (vaginal/caesarian)	21/04	16/09
4.	Gestational age (weeks)	38.1	37.3
5.	Fetal weight (grams)	2717.32	2418.36
6.	APGAR	8.37	7.56
7.	Systolic Blood Pressure (mmHg)	119.04	153.12
8.	Diastolic Blood Pressure (mmHg)	75.28	98.48

Study Exclusion Criteria:

For both groups, the following cases were excluded;

Those with essential hypertension, multiple pregnancy, diabetes mellitus, chronic renal diseases, epilepsy, and hematological disorders

Method

Each umbilical cord was immediately clamped at delivery. In all cases, cord sections were taken 2cm away from the placental and umbilical attachment.

The working method for all of the histological sections followed the routine paraffin procedure as follows:

Fixation in a 10% formalin solution;

Dehydration in ethanol graded series;

Sedimentation in xylene;

Paraffining;

Cutting at 5µm thickness;

Deparaffining;

Hydration;

Staining with hematoxylin and eosin.

Systematic random samples of umbilical cord sections were identified under a microscope and unbiased morphometric study was performed using a Magnus binocular microscope attached with Ocular Micrometer.

The main morphometric and histological parameters for comparative analysis are as follows-

Cord diameter (mm)

Cord total area (mm²)

Jelly area (mm²)

Total vessel area (mm²)

Total lumen area (mm²)

Statistical analysis

All results are expressed as mean values ± SEs. Statistical analysis of data and SEs was calculated for each parameter and estimated in each group. The data was analyzed by an unpaired 't' test and differences were considered significant if P<0.05.

Observations

Comparison of cord diameter in normal and PIH group

Table no.2. Showing the mean values of Cord diameter (mm) of placental side and fetal side in normal and PIH group.

	Placental side			Fetal Side		
	M Mean (mm)	Standard Deviation	Significance (P-value)	Mean (mm)	Standard Deviation	Significance (P-value)
Normal	9.65	0.51	0.01	8.67	0.30	0.00
PIH	7.69	0.41	0.00	6.82	0.31	0.02

P< 0.05 – Significant

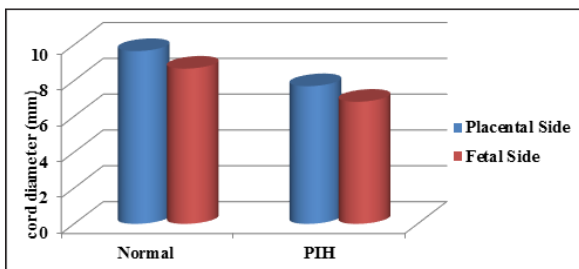


Chart no.1 showing the mean values of Cord diameter (mm) of placental side and fetal side in normal and PIH group.

Comparison of cord area in normal and PIH group

Table no.3. Showing the mean values of Cord area (mm²) of placental side and fetal side in normal and PIH group

	Placental side			Fetal Side		
	Mean (mm ²)	Standard Deviation	Significance (P-value)	Mean mm ²	Standard Deviation	Significance (P-value)
Normal	73.38	7.96	0.00	59.14	4.13	0.00
PIH	46.60	4.94	0.00	36.69	3.41	0.02

P< 0.05 – Significant

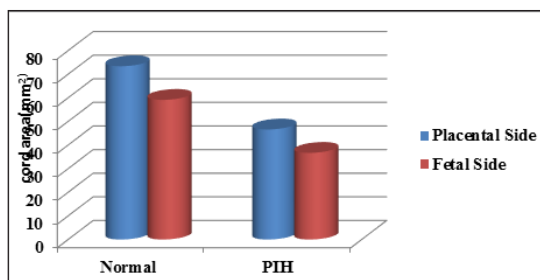


Chart no.2. Showing the mean values of Cord area (mm²) of placental side and fetal side in normal and PIH group.

C) Comparison of Wharton's Jelly area in normal and PIH group

Table no.4. Showing the mean values of Wharton's Jelly area (mm²) of placental side and fetal side in normal and PIH group

	Placental side			Fetal Side		
	Mean mm ²	Standard Deviation	Significance (P-value)	Mean mm ²	Standard Deviation	Significance (P-value)
Normal	64.40	8.20	0.00	50.15	3.88	0.00
PIH	40.21	5.06	0.00	29.34	3.53	0.02

P< 0.05 – Significant

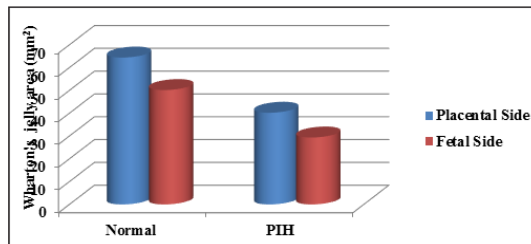


Chart no.3 Showing the mean values of Wharton's Jelly area (mm²) of placental side and fetal side in normal and PIH group

Comparison of Total vessel area in normal and PIH group:

Table no.5. Showing the mean values of Total vessel area (mm²) of placental side and fetal side in normal and PIH group

	Placental side			Fetal Side		
	Mean mm ²	Standard Deviation	Significance (P-value)	Mean mm ²	Standard Deviation	Significance (P-value)
Normal	8.97	1.31	0.00	8.98	0.89	0.01
PIH	6.39	1.02	0.00	7.35	0.95	0.00

P< 0.05 – Significant

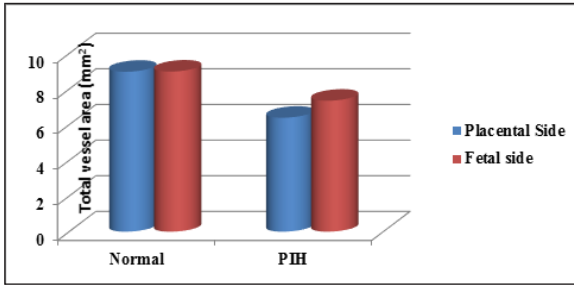


Chart no.4 Showing the mean values of Total vessel area (mm²) of placental side and fetal side in normal and PIH group.

Comparison of Total lumen area in normal and PIH group :

Table no.6. Showing the mean values of Total lumen area (mm²) of placental side and fetal side in normal and PIH group.

	Placental side			Fetal Side		
	Mean mm ²	Standard Deviation	Significance (P-value)	Mean mm ²	Standard Deviation	Significance (P-value)
Normal	3.51	0.44	0.00	3.02	0.39	0.00
PIH	2.10	0.50	0.00	2.09	0.49	0.00

P < 0.05 – Significant

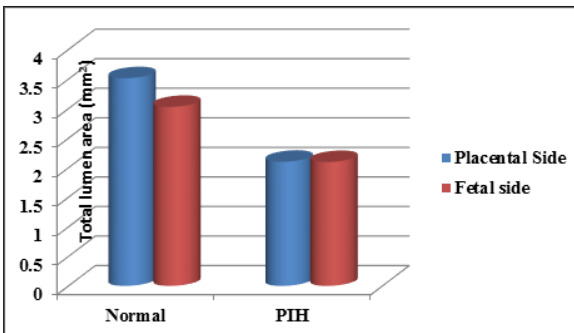


Chart no.5 showing the mean values of Total lumen area (mm²) of placental side and fetal side in normal and PIH group

Results and discussion

The umbilical cord appears to play an important role in interactions between the mother and fetus during pregnancy. In this study, the morphometric and histological differences associated with pregnancy induced hypertension were observed and compared with normal.

In the present study, the mean cord diameter in normal is 9.65mm at placental side and 8.67mm at fetal side. The mean cord diameter in PIH is 7.69mm at placental side and 6.82mm at fetal side. The mean total cord area in normal is 73.38mm² at placental side and 59.14mm² at fetal side. The mean total cord area in PIH is 46.60mm² at placental side and 36.69 mm² at fetal side. The total Wharton jelly area in normal is 64.40mm² at placental side and 50.15mm² at fetal side. The total Wharton jelly area in PIH is 40.21mm² at placental side and 29.34mm² at fetal side. These findings suggest that there is reduction in the cord diameter, total cord area, total Wharton’s area in PIH patients as compared to normal group.

These results are in agreement with the results of the pre-

vious studies of Ilie C. et al (2007), Sevinc I et al (2002), Di Naro E et al (2001), Bruch JF et al (1997).

Changes of the composition of Wharton jelly such as the glycosaminoglycans, water content and extracellular matrix components were the main reasons of the reduction of the diameter of the umbilical cord.⁰These changes might be responsible for the growth factors, which modify myofibroblast proliferation gene expression, protein biosynthesis and other processes.

Conclusion

The morphological and histological changes of the umbilical cord in the PIH represent a marker of some important postnatal and fetal hemodynamic deficiencies.

A good quantification of the morphological and histological changes of the umbilical cord in PIH provides an informational support to the practioners concerning the baby’s neurological development.

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