

## OBSERVATIONS ON VASCULAR PATTERN OF CHORIONIC BLOOD VESSELS OF PLACENTA

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**ABSTRACT: BACKGROUND:** Placenta is a choriodecidual structure develops during pregnancy implanted on the uterine wall and carries vital functions. It is connected to the foetus through umbilical cord. The branches of umbilical vessels that traverse along foetal surface of placenta are referred as chorionic vessels. There are two different patterns of chorionic vessels – Dispersal and Magistral. In the dispersal type, the umbilical vessels undergo successive divisions with gradually diminishing caliber towards periphery while in magistral pattern the vessels traverse to the edge of placenta without appreciable decrease in diameter of vessels. The present study has been done for visualization of the pattern of chorionic vessels in placenta obtained from labour room of a tertiary care hospital in eastern Bihar, India. **MATERIALS AND METHODS:** A total of one hundred and fifty (150) fresh and intact placenta of full term pregnancies collected from Obstetrics & Gynaecology department were included in the study. After washing with distilled water, removal of blood clots were done with slight digital pressure applied over arteries and vein and later on by irrigation with saline. The cut end of the umbilical cord was carefully visualized to identify the umbilical arteries and vein. Dye was injected into umbilical vessels under normal physiological pressure and diameter of chorionic blood vessels were taken at the center and periphery. Ultimately each vessel was followed and examined to observe the dispersal and magistral pattern of chorionic blood vessels of placenta. **RESULTS AND CONCLUSION:** Out of the total of one hundred and fifty (150) full term placenta obtained and examined in the Anatomy department during the study period, 64% Dispersal type & 36 % of Magistral type of arterial pattern of branching of chorionic vessels were observed. Vein and its tributaries presented Dispersal pattern in 60% and Magistral pattern in 40%. There is a significant relationship between the pattern of branching and weight of foetus. Reduction of uteroplacental circulation results in foetal hypoxia & IUGR. The present study aims to observe the incidence of vascular pattern of chorionic blood vessels of placenta.

**KEYWORDS:** Placentae, vascular pattern, chorionic blood vessels, dispersal, magistral.

**INTRODUCTION:** The placenta is a choriodecidual structure develops during pregnancy implanted on the uterine wall near the fundus and carries important and vital functions & activities such as respiration, nutrition, excretion, protection & hormone production.

The foetal part develop from chorionic sac & maternal part derived from endometrium. Foetal surface of placenta is covered with smooth glistening membrane amnion which can be easily stripped upto the umbilical cord. The surface of the chorion thus exposed is also smooth and between its two layers run branches of umbilical vessels called chorionic vessels. These vessels are responsive to vasoactive substance but morphologically functionally and histologically they are peculiar.

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The placenta forms connections with the mother's blood supply from which it supplies oxygen and nutrients to the foetus and it also connects with the foetus's blood supply from which it removes wastes and returns them to the mother's blood.

The chorionic artery always crosses over chorionic vein. Immediately just before or after entering the chorionic plate the two umbilical arteries are joined by transverse connection. Initially the arteries of human placenta are described being similar in their arrangement to the spokes of wheel. In another study it is explained as a star like radiation and the vessels are described as falling into primary, secondary and tertiary groups. But later on, the vascular pattern of placenta is described as of two types – Magistral and Dispersal.

In the dispersal type – the umbilical vessels undergo successive division with gradually diminishing caliber towards periphery, while in magistral type the umbilical vessels is characterized by the arteries that traverse to the edge of placenta without appreciable decrease in diameter of vessels.

In another study there is a significant relationship between the pattern of branching, number of primary divisions of arteries and vein and weight of the foetus. Reduction of uteroplacenta circulation results in fetal hypoxia & IUGR. The study on the vascular pattern of chorionic blood vessels of placenta still lagging behind. The present study aims to observe the incidence of vascular pattern of chorionic blood vessels of placenta in Indian population.

**MATERIALS & METHODS:** One hundred fifty (150) fresh and intact placenta were collected from labour room of the department of Obstetrics & Gynaecology, Katihar Medical College & Hospital, Katihar, Bihar, India, over a span of two years.

All the placenta, after washing with distilled water, fresh specimen were placed in the tray. The cord was cut 6 cm from its attachment to the placenta. From the chorionic surface, the amniotic membrane was removed. Removal of blood clots were done initially with slight digital pressure applied over arteries and vein from peripheral parts of placenta towards the attachment of cord to the placenta and later on by irrigation with saline. For the infusion of colored material in placental vessels the cut end of the umbilical cord was carefully visualized to identify the umbilical arteries and vein. Both of the umbilical arteries were injected with Methylene blue 15 – 20 ml to make them clearly visible blue colored artery and their branches. 0.5% 20 – 30 ml Eosin was injected in umbilical vein to visualize stem of the umbilical vein.

Each vessel was followed and examined to count its dispersal and magistral pattern. In the dispersal type, the two arteries divide dichotomously several times into a number of smaller vessels, rapidly diminishing in caliber. In the magistral type the two arteries were extend almost to the margin of placenta before diminution in their caliber.

Diameter of chorionic blood vessel was taken by vernier caliper at the site of insertion of umbilical cord (c) and at the periphery (p). It was categorized into two groups on the following criteria if the ratio of diameter of chorionic blood vessels of placenta at the periphery and at the center (p/c) is half or less than half it is categorized into dispersal type, more than half then it is categorized into magistral type.

Mean and standard deviation of all observations were calculated. Mean is the arithmetic means of all observations. Standard deviation is the measure of variation. It is defined as root – mean – square deviation.

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**OBSERVATION:** One hundred fifty (150) fresh full term placenta were obtained for study and examined. Diameters of chorionic blood vessels of placenta were measured after washing and injecting the dye under normal physiological pressure. Two types of vascular pattern were observed – Dispersal and Magistral. Diameter of chorionic blood vessels showed decreasing trend from center to periphery in dispersal pattern while in the magistral pattern diameter of chorionic blood vessels was almost same throughout its whole extent.

Arterial pattern of branching of chorionic vessels was of dispersal type in 64% and magistral type in 36%. The maximum number of primary divisions of arteries ranged between 4-6 in Dispersal pattern with the mean of 4.62 and standard deviation of 1.39 & maximum number of primary divisions of artery in Magistral pattern ranged between 3-6 with the mean of 4.11 and standard deviation of 1.80 [Table 1].

Vein and its tributaries presented Dispersal pattern in 60% and Magistral pattern in 40%. In dispersal pattern maximum number of tributaries in vein ranged from 3-6 with the mean of 4.90 and standard deviation of 1.45. Maximum number of tributaries in vein is Magistral pattern ranged from 3-5 with mean of 4.75 and standard deviation of 1.31 [Table 2].

Sl.no	Number of Primary Division	Dispersal type		Magistral type	
		No. of Placenta	Percentage	No. of Placenta	Percentage
1	1	03	02.0	03	02.0
2	2	03	02.0	06	04.0
3	3	06	04.0	15	10.0
4	4	36	24.0	09	06.0
5	5	27	18.0	09	06.0
6	6	12	08.0	06	04.0
7	7	06	04.0	03	02.0
8	8	03	02.0	03	02.0
9	Total	96	64%	54	36%

**Table 1: Number of primary Division of Arteries**

Dispersal:- Mean – 4.62 ± S.D – 1.39

Magistral:- Mean – 4.11 ± S.D – 1.80

Sl.no	Number of Primary Division	Dispersal type		Magistral type	
		No. of Placenta	Percentage	No. of Placenta	Percentage
1	1	00	00.0	00	00.0
2	2	00	00.0	00	00.0
3	3	15	10.0	09	06.0
4	4	27	18.0	21	14.0
5	5	21	14.0	15	10.0
6	6	12	08.0	09	06.0
7	7	09	06.0	03	02.0
8	8	06	04.0	03	02.0
9	Total	90	60%	60	40%

**Table 2: Number of primary Division of Veins**

Dispersal:- Mean – 4.90 ± S.D – 1.45

Magistral:- Mean – 4.75 ± S.D – 1.31

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**DISCUSSION AND CONCLUSION:** During intrauterine existence the foetus depends upon the placenta as its Lungs, Liver and Kidney. Despite its major role in human development, the study of placenta has lagged behind that of foetus. A number of anatomists and embryologist worked through 1980s to provide some basic knowledge (Cunnigham et al.).

The vascular pattern of chorionic blood vessels of placenta is described as of two types- Magistral and dispersal (Schordania). In the dispersal pattern umbilical vessels undergo successive divisions and rapidly diminish in caliber while in magistral pattern umbilical vessels give side branches and the caliber of vessels is almost equal upto periphery. The vascular character of foetal placental vasculature is already recognizable at 12<sup>th</sup> week of pregnancy (Bacsich & Crawford). In the present study dispersal pattern showed successive divisions of umbilical vessels with decreasing caliber from center to periphery while the magistral pattern showed fewer divisions of blood vessels with appreciably no decrease in diameter from centre to periphery.

The pattern of branching of blood vessel is dispersal (with radiating spoke like arrangement) in 81 cases and magistral (with marginal cord attachment and vascular channels) in 86 cases (Bhargava & Raja). The incidence of dispersal pattern is 63% and that of magistral pattern is 37% (Cunnigham et al.). In the present study the incidence of dispersal pattern is 64% and magistral pattern is 36% in arterial pattern of branching of chorionic vessels which is very close to the above findings.

It is noted that certain anatomic characteristic such as pattern of branching, number of primary divisions of arteries and veins are determined at an earlier stage of development. After determination of these characteristics, the parameters differentiate in response to functional demands, stress and strain in subsequent developmental periods (Bhargava & Raja; Schordania; Bacsich & Crawford). In another study it is observed that there is significant relationship between patterns of branching, number of primary divisions of arteries and weight of foetus.

In the present series number of primary divisions of arteries usually lies between 3-6 both in magistral and dispersal pattern. The observations in the present series reveal the pattern of vein and arteries in the present series did not necessarily correlate with each other. Out of 150 placenta dispersal type is 64% and magistral type is 36% in arterial pattern of branching while vein and tributaries presented dispersal pattern in 60% and magistral in 40%. Present study gives broad range of information regarding vascular pattern of chorionic blood vessels of placenta.

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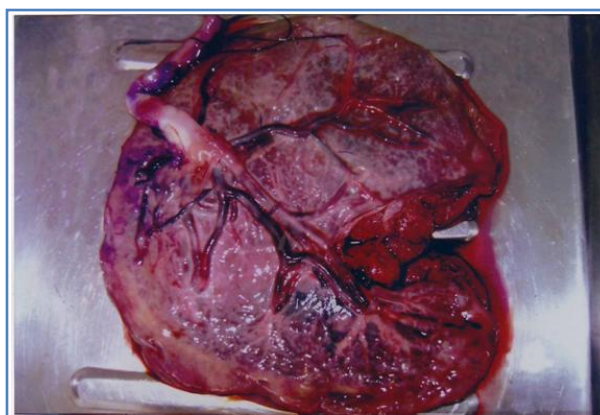
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PLACENTA SHOWING MAGISTRAL - TYPE OF VASCULAR PATTERN.



PLACENTA SHOWING DISPERSAL - TYPE OF VASCULAR PATTERN

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