HISTOPATHOLOGICAL CHANGES OF PLACENTA IN PRETERM PREGNANCY WITH SPECIAL REFERENCE TO INTRAUTERINE GROWTH RESTRICTION

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ABSTRACT

BACKGROUND AND OBJECTIVES

The aim of this study was to analyse the placental lesions associated with restricted foetal growth in infants delivered for obstetric indications in preterm pregnancy with no apparent aetiologic factor.

MATERIALS AND METHODS

A prospective study was done in Pathology Department in collaboration with Department of Obstetrics and Gynaecology of Dr B R Ambedkar Medical College Hospital from July 2011 to June 2013 on pregnant women with Intrauterine Growth Restriction (IUGR) and preterm labour. Seventy cases from July 2011 to June 2013 were included in the study.

RESULTS

Of the 70 cases, 50 preterm and 20 term placentas studied, the weight of the placenta was less in IUGR compared to normal placenta. The incidence of IUGR is more in case of preterm placenta (94%) than term placenta (20%). Present study showed 50% of IUGR cases had increased intervillous space, 18% of preterm placenta had increased intervillous fibrin deposits, Acute chorioamnionitis in 24% cases of IUGR, chorangiosis in 18% cases of IUGR, infarction in 10% cases.

CONCLUSION

Pathological abnormalities are due to foetal and maternal vasculopathies in placenta.

KEYWORDS

Preterm, Placenta, Intrauterine Growth Restriction, Chorioamnionitis, Chorangiosis.

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INTRODUCTION: Placenta is the only gestational organ which functions as the source upon which the developing foetus derives its nutritional substance and obtains its metabolic and immunological requirements.[1] The functions of placenta include: important source of hormones, cytokines and growth factors necessary for continuation of pregnancy,[2] transfer and metabolic functions that is exchange of respiratory gases, nutrients and waste products between foetal and maternal circulation across placental membrane,[3] also protects the foetus from infections as active immune barrier.

Defects in formation and function of placenta have been associated with adverse pregnancy outcomes such as IUGR, pre-eclampsia, preterm birth (PTB) providing further evidence for a critical role of placenta in maternal and foetal physiology.[4]

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Preterm labour is defined as labour that begins before 37 completed weeks of pregnancy.[5] PTB is a major public health problem that has significant adverse impact on health outcomes in childhood which often extends into adulthood. IUGR is defined as birth weight less than 10th percentile of predicted foetal weight for the gestational age.[6] IUGR is a complicated placental vascular disease resulting in PTB, low birth weight and increased perinatal morbidity and mortality. Angiogenesis defined as development of new vascular structure is a placental factor playing important role in development of IUGR.[7] Histopathological studies of placenta in IUGR indicate abnormalities of maternal spiral arterioles, dysregulated villous vasculogenesis and abundant fibrin deposition.[8]

The following lesions of placenta are of importance in IUGR and preterm labour. Placental infarction is a result of occlusion of artery and necrosis of cotyledon and villi.[9] There is a strong correlation between presence and amount of infarcted placenta and IUGR. Placental calcification is often found in pregnancy at term and regarded as physiological ageing process. Preterm placental calcification is associated with higher incidence of poor uteroplacental blood flow.[10] Coagulation related lesions such as intervillous thrombosis are reported in IUGR placentas.

These observations raise the question whether coagulation in placental circulation is the cause for IUGR.[11]

Increased numbers of syncytial knots, sprouts and bridges in placenta are called Tenney-Parker Changes (TPC) and are found in hypoxic conditions like pre-eclampsia, maternal anaemia, high altitude pregnancy and IUGR.[12] Marked thickening of Trophoblastic Basement Membrane is present in pathological conditions like pre-eclampsia and IUGR.[13]

Acute chorioamnionitis is presence of acute inflammatory cells in the foetal membranes. Chronic villitis is infiltration of lymphocytes and histiocytes affecting the chorionic villi. Chronic villitis may be infectious or nonspecific that is Villitis of Unknown Aetiology (VUE). VUE is shown to be associated with IUGR.[14]

Chorangiosis is diffuse increase in number of villous capillaries in terminal villi of placenta and occurs in chronic prenatal hypoxia. Chronic deciduitis is lymphohistocytic infiltration with plasma cells in the decidua of placenta.[15] Mural hypertrophy of decidual arteries is thickening of maternal arterioles in decidua parietalis. Acute atherosis is fibrinoid necrosis of arterial smooth muscles in maternal arteries of basal plate, marginal zone and membranous decidua of placenta. Villous agglutination is defined as clusters of adherent distal villi agglutinated by fibrin and syncytial knots accompanied by stromal fibrosis, cellular degeneration. Villous stromal vascular karyorrhexis is three or more foci of two or more terminal villi showing karyorrhexis of foetal cells with preservation of surrounding trophoblast.[16]

OBJECTIVES:

- To compare the histomorphological study of preterm placenta with that of normal placenta.
- To study association of IUGR with preterm placenta.
- To study the pathogenesis of preterm placenta and its cause for IUGR.
- To study the effect of preterm placenta in relation to morbidity and mortality.

METHODOLOGY: A prospective study was done in Pathology Department in collaboration with Department of Obstetrics and Gynaecology of Dr B R Ambedkar Medical College Hospital from July 2011 to June 2013 on pregnant patients with Intrauterine Growth Restriction (IUGR) and preterm labour. Placenta obtained after delivery was fixed in 10% formalin for 24 hours. After fixation, the placenta was examined for gross abnormalities and then processed for routine paraffin embedding. Histopathological slides were prepared for staining with Haematoxylin and Eosin, Periodic Acid Schiff methods using paraffin blocks. The inclusion criteria were pregnant women with IUGR and preterm labour and exclusion criteria was damaged placentas.

RESULTS: The cases were divided into Term and Preterm placenta with IUGR and without IUGR.

Groups	IUGR	Without IUGR	Grand Total
Term placenta	4	16	20
Preterm placenta	48	2	50
Grand Total	**52**	**18**	**70**

Table 1: Distribution of Cases

Age Group	Preterm Placenta	Term Placenta	Total
19 – 25	33	11	44
26 – 30	13	8	21
31 – 40	4	1	5
Total	**50**	**20**	**70**

Table 2: Age wise distribution of Antenatal Women

Groups	22 – 26 weeks	27 – 36 weeks	37 – 40 weeks	Total
IUGR	1	47	4	52
Without IUGR	1	2	15	18
Total	**2**	**49**	**19**	**70**

Table 3: Cases of IUGR and without IUGR with respect to Gestational Age

IUGR cases are high between 27 to 36 weeks of gestation.

IUGR	Decreased	Increased	Normal	Total
Term placenta	4	0	0	4
Preterm placenta	16	26	6	48
Grand Total	**20**	**26**	**6**	**52**

Table 4: Intervillous Space Increased or Decreased with IUGR

Without IUGR	Decreased	Increased	Total
Term placenta	14	2	16
Preterm placenta		2	2
Grand Total	**14**	**4**	**18**

Table 5: Intervillous Space Increased or Decreased without IUGR

Intervillous space has significantly increased in preterm placenta with IUGR, the incidence being 50% in the present study.

IUGR	Increased	Normal	Total
Term placenta	2	2	4
Preterm placenta	13	35	48
Total	**15**	**37**	**52**

Table 6: Relation of Intervillous Fibrin in IUGR

Increased intervillous fibrin is more in preterm placenta with IUGR.

Placenta	Preterm	Preterm IUGR	Term	Term IUGR
Acute chorioamnionitis	13 (26 %)	12 (24 %)	0	0
Chorangiosis	9(18 %)	9(18 %)	0	0
Intervillous thromboses	7(14 %)	7(14 %)	0	0
Villous stromal fibrosis	4 (8 %)	4(8 %)	0	0
Tenney-Parker changes	14 (28 %)	14 (28 %)	2 (10 %)	0

Table 7: Incidence of Acute Chorioamnionitis, Chorangiosis, Intervillous Thrombosis, Villous Thrombosis, Villous Stromal Fibrosis, Tenney-Parker Changes

The overall incidence of acute chorioamnionitis, chorangiosis, intervillous thrombosis, villous stromal fibrosis and syncytial knotting is increased in preterm placenta and preterm placenta with IUGR.

Placenta	Preterm	Preterm IUGR	Term	Term IUGR
Fibrinoid necrosis	5(10%)	5(10%)	2(10%)	0%
True infarcts	6(12%)	6(12%)	1(5%)	0%
Basement membrane thickening	1(2%)	1(2%)	0%	0%

Table 8: Incidence of Fibrinoid Necrosis, True Infarcts, Basement Membrane Thickening

It is evident from the above table that normal placenta do show fibrinoid necrosis. The incidence of fibrinoid necrosis in preterm placenta with IUGR is 10%. True infarcts are more in preterm (12%) and preterm with IUGR (12%) and only 5% of normal placenta showed true infarcts in the present study.

Placenta	Preterm	Preterm IUGR	Term	Term IUGR
Mural hypertrophy	2(4%)	2(4%)	3(15%)	15(75%)
Acute atherosis	9(18%)	3(6%)	4(20%)	5(25%)
Chronic deciduitis	24(48%)	20(40%)	10(48%)	10(50%)

Table 9: Incidence of Mural Hypertrophy, Acute Atherosis, Chronic Deciduitis

Placenta	Preterm	Preterm IUGR	Term	Term IUGR
Chronic villitis	14(28%)	14(28%)	4(20%)	10(50%)
Villous agglutination	34(68%)	34(68%)	8(40%)	10(50%)
Villous stromal vascular karyorrhexis	17(34%)	17(34%)	3(15%)	10(50%)

Table 10: Incidence of Chronic Villitis, Villous Agglutination, Villous Stromal Vascular Karyorrhexis

In the present study, almost all the placenta from the various groups showed chronic villitis, villous agglutination and villous vascular karyorrhexis with high incidence in IUGR cases.

Placenta	Preterm	Preterm IUGR	Term	Term IUGR
Nucleated RBC	32(64%)	32(65%)	3(15%)	15(75%)
Intimal fibrin cushion	9(18%)	9(18%)	2(10%)	10(50%)
Obliterative endarteritis	5(10%)	5(10%)	2(10%)	10(50%)

Table 11: Incidence of Nucleated RBC, Intimal Fibrin Cushion, Obliterative Endarteritis

The incidence of nucleated RBC, intimal fibrin cushion and obliterative endarteritis is almost same in preterm and preterm with IUGR with incidence being high in term IUGR.

DISCUSSION: The gross and microscopic pathological examinations of the placenta are invaluable tools for elucidating the pathophysiology underlying IUGR and can help us understand the causes and risks of recurrence. Placental insufficiency is the most common cause of IUGR.

Histological evaluation of the placentas from IUGR pregnancies has significantly contributed to our understanding of involved pathophysiology. Impairment in the invasion of foetal trophoblast cells into maternal decidua has been hypothesised as a cause of placental insufficiency and this leads to IUGR.

The gross findings of placentas from IUGR pregnancies include a reduced placental weight, a thin umbilical cord and parenchymal loss. The histological findings include changes in terminal chorionic villi such as increased syncytial knots or villous infarcts by maternal under-perfusion, foetal blood supply abnormalities due to foetal thrombotic vasculopathy and inflammatory conditions of placental membrane such as chorioamnionitis.

Comparison of present study with other studies.

	Increased Intervillous Fibrin
Nayere H Ghomain, et al[17]	43.5 %
Chang Young Yoo et al[18]	15 %
Present study	15 %

Table 12: Comparison of Intervillous Fibrin

Increased intervillous fibrin in the present study coincided approximately with that of Chang Young Yoo et al.

	Intervillous Thromboses
Rajeev Mehta et al[19]	16 %
Walker MG et al[20]	72 %
Present study	14 %

Table 13: Comparison of Intervillous Thromboses

The findings of present study correlated approximately with that of Rajeev Mehta et al.

	Acute Chorioamnionitis
Chang Young Yoo et al[18]	3 %
Rajeev Mehta et al[19]	38 %
Present study	24 %

Table 14: Comparison of Acute Chorioamnionitis

	Chorangiosis
Chang Young Yoo et al[18]	9 %
Present study	18 %

Table 15: Comparison of chorangiosis

	Chronic Deciduitis
Chang Young Yoo et al[18]	49 %
Walker MG et al[20]	17 %
Present study	49 %

Table 16: Comparison of Chronic Deciduitis

The findings of the present study coincided with that of Chang Young Yoo.

	Tenney-Parker Changes
Chang Young Yoo et al[18]	51.4 %
Present study	29 %

Table 17: Comparison of Tenney-Parker Changes

	Chronic Villitis
Chang Young Yoo et al[18]	30 %
Walker MG et al[20]	3.9 %
Present study	3 %

Table 18: Comparison of Chronic Villitis

	Infarction
Chang Young Yoo[18]	26 %
Rajeev Mehta et al[19]	27 %
Walker MG et al[20]	62.7 %
Present study	12 %

Table 19: Comparison of Infarction

	Chang Young Yoo et al	Present study
Villous agglutination	31 %	72 %
Villous stromal vascular karyorrhexis	31 %	36 %
Obliterative endarteritis	8.6 %	10 %
Intimal fibrin cushion	49 %	21 %
Mural hypertrophy	14 %	9 %

Table 20: Comparison of Villous Lesions

CONCLUSION: The placenta is often the most accessible and readily evaluable component of the triad of mother, infant and placenta. It reflects the intrauterine environment. Placental pathology has been implicated in the pathogenesis of preterm neonatal morbidity. Therefore, placental examination may represent a means of investigating the intrauterine past to explain the present condition of neonate. Timely examination of placenta may even help in guiding therapies or surveillance of infants deemed at increased risk for mortality or significant morbidity.

Although pathologic examination of the placenta may not be a primary tool for the diagnosis of pathologic IUGR, the histopathologic findings can be informative for understanding the pathophysiology underlying IUGR.

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