PLACENTA IN INTRAUTERINE GROWTH RETARDATION†

by

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In India, 15% to 30% of the babies born at term are 'small for date' (Ghosh, 1967). Undernutrition and toxaemia of pregnancy are considered to be important maternal causes for this. In toxaemia of pregnancy, placenta has been studied extensively and has been shown to undergo premature "ageing". "Ageing" and "Growth Retardation" are suggested to be graft rejection phenomenon. With this in mind, the various changes of senescence in placenta were quantitatively studied in cases of toxaemia, anaemia, and unexplained growth retardation and compared with healthy controls.

Material and Methods

Placenta was studied in 100 term parturients admitted to labor ward of Lady Hardinge Medical College & Hospital, New Delhi. These parturients included,

Group I:	Control: Normal term parturients	25
Group II:	Intrauterine growth retardation Birth weight less than 2500 gms.	25
Group III:	Toxaemia of pregnancy with Blood Pressure of 130 + 90 mm. of Hg. and above with or without edema and/or proteinurea	25
Group IV:	Anaemia of pregnancy Hb. less than 8.0 gm%	25

Each placenta was fixed in 10% buffered formalin, trimmed of membranes, measured, weighed and examined grossly for degree of calcification, extent of infarction and sub-chorionic fibrin deposit.

From each placenta, 8 whole thickness tissue blocks, 2.5 cms x 0.5 cms in size were taken from definite representative sites along an S-shaped area so as to include all areas of placenta. The tissues were processed for paraffin blocking and sections cut, 5-7 u in thickness, stained with conventional haematoxylin and eosin stain and with periodic acid Schiff reagent as a special staining procedure. Random microscopic fields were selected from each slide and at least 800 villi were studied for:

1. Intervillous fibrin deposits: This was graded according to the extent of deposit in each high power field (H.P.F.), minimal as grade I, moderate as grade II and extensive as grade III.

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2. Intra villous fibrin or fibrinoid change of whole villous.
3. Basement membrane thickening
4. Villous fibrosis.
5. Syncytial knots.

These changes in different groups were quantitatively compared.

Observation

I. In the normal control (Group I) placenta was 16 cms. or more in diameter in 88% of cases and weighed more than 300 cms. The mean placental co-efficient being 0.14 (S.D.O. .03). Infarction was absent in 75% of cases and when present involved less than 5% of the total surface area, subchorionic fibrin was absent in 52% and calcification was absent in 60% of control placentae.

The incidence of Syncytial knots never exceeded 60% and was found usually to be less than in 30% of villi. Fibrinoid deposit in villi if present was usually observed in less than 5% of villi, and never in more than 10% of villi. Thickening of basement membrane, if present, was restricted to less than 2% of villi. Intervillous fibrin deposit was absent in the majority, only a minimal degree of it was observed in 3 placentae. Eighty-eight per cent of placentae did not show any fibrosed villi and in remaining it was seen in less than 3% of villi (Table I, Fig. 1).

II. Placenta in IUGR i.e. Group II—76% of placentae were less than 16 cms in diameter, and 80% weighed less than 300 gms; however, mean placental co-efficient was 0.14 i.e. same as in control cases. High placental co-efficient of 0.16 to 0.19 was more often in control and anaemia group. No significant increase was found in calcification or infarctions. Significant decrease was found in subchorionic fibrin deposit. Eighty per cent placentae in IUGR had no subchorionic fibrin as compared to 52% of the control placentae. High syncytial knot count was more often observed. Fibrinoid necrosis of villi and thickening of basement membrane are significantly increased in toxaemic placentae and to a lesser extent in placentae of IUGR as reported earlier by Mirchandani *et al* (in press). Intervillous fibrin deposit of grade II (i.e. moderate amount in H.P.F.) and of grade III was significantly increased in toxaemia and in placentae of IUGR ($x^2 = 50.38$ highly significant)—compared to control. Significant increase was also found in frequency of fibrosed villi ($x^2 = 9.34$ significant). Table I Fig. 1.

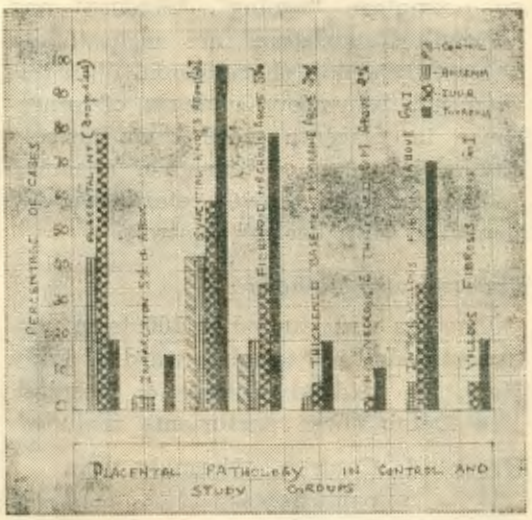

Fig. 1

III. Placentae of only low birth weight babies in different groups are analysed in Table II.

Syncytial knots were observed in more than 30% of villi in all of the 9 low birth weight babies of toxaemia group and in 15 of the 25 IUGR group but 8 out of 12 low birth weight babies of anaemic

TABLE I

Placental Finding in Different Groups

Placental Pathology	Control		Toxaemia		L.U.G.R.		Anaemia	
Placental wt 300 gm and less	—	—	5	(20)	20	(80)	11	(44)
Placental coefficient more than 0.2	1	(4)	—	—	2	(8)	3	(12)
Placental infarction more than 5%	1	(4)	4	(16)	—	—	1	(4)
Absent calcification	15	(60)	17	(68)	13	(52)	20	(80)
Absent subchorionic fibrin	13	(52)	23	(92)	20	(80)	22	(88)
Syncytial knot more than 30%	11	(44)	25	(100)	15	(60)	11	(44)
Fibrinoid necrosis more than 5%	4	(16)	20	(80)	9	(36)	5	(20)
Thickened basement membrane more than 2%	—	—	5	(20)	2	(8)	1	(4)
Both together more than 2%	—	—	3	(12)	1	(4)	—	—
Intervillous fibrin grade more than (i)	—	—	18	(72)	9	(36)	1	(4)
Villous fibrosis more than grade (i)	—	—	5	(20)	2	(8)	—	—

(Figures in brackets are percentages).

TABLE II

Placental Changes Seen in Low Birth-Weight Babies in Different Groups

Placenal Pahology	Tokaemia (9)	I.U.G.R. (25)	Anaemia (12)
Placental weight 300 gms or less	5 (55.5)	20 (80)	2 (16.6)
Infarction 5% and above	6 (66.6)	0 (0)	0 (0)
Calcification ++	0 (0)	2 (8)	0 (0)
Subchorionic fibrin++	0 (0)	0 (0)	0 (0)
Syncitial knots Gr. I	9 (100)	15 (60)	4 (33.2)
Fibrincid necrosis 5%	9 (100)	9 (36)	2 (16.6)
Thickened basement membrane 2%	3 (33.3)	2 (8)	1 (8.3)
Fibrincid Ne. thickened basement membrane 2%	3 (33.3)	1 (4)	0 (0)
Intervillous fibrin Gr. I	6 (66.6)	9 (36)	0 (0)
Villous fibrosis Gr. I	2 (22.2)	2 (8)	0 (0)

(Figures in brackets are percentages).

TABLE III

Correlation of Gross Changes in Placenta and Foetal Weight

Pathology in Placenta	Parameter Counts	Foetal less than 2.5 Kg. (46)	Foetal More than 2.5 Kg. (54)
Placental weight	0-300 gms	27 (58.4)	9 (16.6)
	301-500 gms	18 (39.4)	33 (61.2)
	500 gms	1 (2.2)	12 (22.2)
Infarction	Absent	28 (60.4)	35 (67.8)
	1—4%	12 (26.4)	14 (25.8)
	5—9%	5 (11.0)	5 (7.4)
	10% & above	1 (2.2)	
Calcification	Absent	29 (63.8)	36 (76.8)
	+	15 (33.0)	14 (25.8)
	++	2 (4.4)	4 (7.4)
Subchorionic fibrin	Absent	39 (85.8)	39 (72.4)
	+	7 (15.2)	13 (23.9)
	++	— (—)	2 (3.7)

(Figures in Brackets are percentages).

TABLE IV

Correlation of Microscopic Changes in Placenta With Foetal Weight

Placental Pathology	Parameter Counts	Foetus Less than 2.5 Kg.	Foetus more than 2.5 Kg.
Syncitial knots	Gr I (0-36%)	18 (39.6)	20 (37.14)
	Gr II (30-60%)	14 (30.6)	22 (40.7)
	Gr III (60-90%)	10 (22)	12 (22.2)
	Gr IV (>90%)	4 (8.8)	
Fibrinoid Necrosis	0-5%	26 (57.2)	36 (66.7)
	6-9%	19 (40.6)	16 (29.6)
	10% & above	1 (3.2)	2 (3.7)
Thickened basement membrane	Absent	5 (11.0)	23 (42.6)
	0-2%	35 (76.0)	29 (53.7)
	Above 2%	6 (13.0)	2 (3.7)
Fibrinoid necrosis and thickened basement membrane	Absent	29 (62.8)	40 (74.1)
	0-2%	15 (33.0)	12 (22.2)
	Above 2%	2 (4.4)	2 (3.7)
Intervillous fibrin	Gr. 0	21 (45.2)	30 (55.7)
	Gr. I	10 (22.0)	11 (20.3)
	Gr. II	2 (26.2)	11 (20.3)
	Gr. III	3 (6.6)	2 (3.7)
Villous Fibrosis	Absent	37 (80.4)	42 (77.8)
	Gr. I	6 (13.2)	8 (14.8)
	Gr. II	3 (6.4)	4 (7.4)

(Figures in brackets are percentages).

mothers did not show this high count. Similarly villous fibrinoid necrosis and intervillous fibrin deposit are more often associated with toxaemia and IUGR but not with low birth weight babies of anaemia group. Villous fibrosis is not a common feature.

IV. Tables III and IV reveal that there is no single common pathological feature which is increased statistically in placentae of low birth weight babies when all are grouped together irrespective of maternal complications, and compared with placentae of normal birth weight babies. Fibrinoid necrosis and thickened basement membrane are more frequent in low birthweight babies.

Discussion

Inspite of extensive work no specific lesion in placental histology is found in toxaemia of pregnancy and same is the situation in cases of unexplained intrauterine growth retardation. This may be due to probable underlying multiple etiology in both conditions. The only significant finding which has been noticed by many workers is decrease in size and weight of placentae in IUGR group. In the present study, mean diameter was 15.3 cm (S.D. 1.28) compared to 17.54 (S.D. 1.54) in control cases and mean weight was 288.0 gms (S.D. 5.27) compared to 466.8 (S.D. 8.10). Placental co-efficient was not altered, however Khatoon *et al* (1977) from Delhi found feto-placental coefficient significantly increased in intrauterine growth retardation. They considered their own parameter of 2 S.D. below average birth weight of their hospital. Low nutrition as an etiological factor is suggested by Murthy *et al* (1976) from Varanasi who found both birth weight and placental weight to be decreased with decreasing caloric intake in lower socioeconomic groups.

Glycogen breakdown was found to be higher in placentae of small for date babies by Leela Iyenger (1973) from Hyderabad; this according to her was due to acceleration of ageing process. Syncitial knot formation is considered to be a change of senescence and is specifically increased in toxaemia of pregnancy. It was increased to a lesser extent in IUGR group, but when all low birth weight babies i.e. also those of anaemia and toxaemia were grouped together and their placentae studied, frequency of syncitial knot was not found to be increased. Same was observed about the frequency of stromal fibrosis of villus though Warkaney (1961) found it often associated with growth retardation. The opinions differ regarding the significance of intervillous fibrin deposition which, like thrombus formation, may be deposited due to any alteration in blood or blood flow or damage to endothelium. Significant increase in the extent of intervillous fibrin deposition is found in placentae of IUGR group. This histological change is also not specific though quantitatively significant.

We have reported earlier (Mirchandani *et al*, In Press) that basement membrane of villous is significantly more often thickened in IUGR group. This basement membrane thickening in association with fibrinoid necrosis of villous is considered by Sen and Langley (1974) to be a manifestation of an immune reaction and significantly correlated to intra-uterine growth retardation. Geoffrey *et al* (1975) also reported increased fibrinoid change of villous. Bonner *et al* (1975) have demonstrated extensive atherosclerotic changes and fibrin deposition in maternal arterial supply to the placenta, etiology of these

changes is uncertain. Possibly this also is a rejection phenomenon.

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