HISTOPATHOLOGICAL CHANGES IN PLACENTA IN TOXAEMIA OF PREGNANCY

by

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SUMMARY

Histological study of 25 placentae obtained from toxaemic mothers divided into eclampsia, mild and severe pre-eclampsia depending upon blood pressure, oedema and albuminuria has been studied and compared to placentae of 25 healthy mothers as control.

Significant decrease in villous vascularity and vasculosyncytial membranes were found in severely pre-eclamptic and eclamptic placentae as ompared to normal full term placenta.

Higly significant increase in thickening of basement membrane, endarteritis obliterans and increase in syncytial knots have been observed in toxaemic placentae. Basement membrane thickening is due to uteroplacental ischamia and syncytial knots are increased due to reduced foetal perfusion.

No significant change was observed in villous stromal fibrosis and fibrinoid necrosis in cases of toxaemia.

Introduction

Toxaemia of pregnancy is the leading cause of maternal mortality and is an important factor in foetal wastage. The incidence is high in backward countries with malnutrition, hypoproteinaemia and poor obstetric facilities. The incidence of pre-eclampsia and eclampsia is 6% and 0.05% respectively in U.S.A. In India, the incidence of pre-eclampsia is 1.5%. In all earlier studies gross abnormalities of placentae have received undue atteniton and undeserved status. Recently, villous tissue changes have proved a relationship between placental pathology and foetal well being. Till date only a few inconsistent reports have appeared in the literature on histopathology of placenta in toxaemia of pregnancy (Salvatore, 1966; Mathews *et al,* 1973; Sayeed *et al,* 1976; Kher *et al,* 1981 and Bhatia *et al,* 1981).

The present study was undertaken to assess the significance of villous abnormalities by histopathological methods because these changes serve as a rough

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guide to the duration and severity of disease.

Material and Methods

The present study was conducted on 50 placentae selected at random from the mothers delivered at the department of Obstetrics & Gynaecology, P.B.M. Group of Hospitals, Bikaner. Twenty-five out of 50 placentae were from uncomplicated full term deliveries (controls) and 25 placentae were from cases of pre-eclamptic toxaemia and eclampsia.

The cases/controls were divided into 4 groups, viz., eclampsia (Group I) 6 cases, severe pre-eclampsia (Group II) 6 cases, mild pre-eclampsia (Group III) 13 cases and controls (Group IV) 25 healthy women. The criteria for diagnosis of pre-eclampsia were elevated blood pressure in excess of 140/90 mm of Hg recorded for the first time after 28th week of pregnancy with oedema and/or albuminuria.

The placentae were collected soon after delivery, washed with water so as to clean all blood and then fixed in 10% formal saline. Five whole thickness tissue blocks were taken from each placenta from definite representative sites along an 'S' shaped area. Tissues were processed for routine paraffin embedding. Sections were cut at 5-7 μ thickness and finally stained with H & E. Whenever needed, special stains viz., PAS, Van Gieson and P.T.A.H. were done to confirm villous pathology.

Observations and Discussion

Table I shows that in patients having eclampsia (Group I) the ratio of cases falling in younger age range (11-20 years) was higher (66.7%) as compared to controls (40.0%). Albuminuria was present in 100 per cent (6 cases) of eclampsia, 83.3 per cent (5 cases) of severe PET, 32.5 per cent (5 cases) of

TABLE I

Age Distribution, Albuminuria, Oedema and Blood Pressure in Patients With Pregnancy Toxaemia and Controls

S. No.	Clinical feature	Group I (6 cases)		Group II (6 cases)		Group III (13 cases)		Group IV (25 controls)	
		No. of cases	Percentage	No. of cases	Percentage	No. of cases	Percentage	No. of cases	Percentage
1.	*Age (Years)*								
	11 - 20	4	66.7	1	16.7	2	15.4	10	40.0
	21 - 30	2	33.3	3	50.0	10	76.9	15	60.0
	31 - 40	0	0.0	2	33.3	1	7.7	0	0.0
2.	Albuminuria	6	100.0	5	83.3	5	38.5	0	0.0
3.	Oedema	6	100.0	6	100.0	13	100.0	0	0 0
4.	Blood pressure (*mm Hg. Mean* ± *S.D. & range*)								
	Systolic	161.7 ± 6.9 (150-170)		170.0 ± 27.7 (150-230)		141.5 ± 3.6 (140-160)		115.2 ± 5.0 (110-120)	
	Diastolic	113.3 ± 9.5 (100-130)		113.3 ± 7.5 (100-120)		92.3 ± 6.9 (90-100)		74.4 ± 5.7 (70-90)	

mild PET and in none of healthy controls. Oedema was present in 100 per cent cases of eclampsia (6 cases), severe PET (6 cases) and mild PET (13 cases), while none of healthy controls had oedema. Mean systolic blood pressure was higher in eclampsia (161.7 ± 6.9), severe PET (170.0 ± 27.7) and mild PET (141.5 ± 3.6) as compared to controls (115.2 ± 5.0). Similarly diastolic blood pressure was also higher in eclampsia (113.3 ± 9.5), severe PET (113.3 ± 7.5) and mild PET (92.3 ± 6.9) as compared to controls (74.4 ± 5.7).

Histological findings in cases of test and control groups have been shown in Table II. In the placentae from control group, villous vascularity was found to be normal in 88% women while hypovascularity was observed in none of control women. In the placentae from toxaemic cases a significant ($p < 0.01$) disease in the vascularity of the villi was observed. This observation is in accordance with that of Shanklin (1959). However, Sayeed *et al* (1976) did not find any significant change

TABLE II

Showing Various Histopathological Features of Placentae in Patients with Pregnancy Toxaemia and Controls

S. No.	Histopathological feature	Group I (6 cases) No. of cases	Group I (6 cases) Percentage	Group II (6 cases) No. of cases	Group II (6 cases) Percentage	Group III (13 cases) No. of cases	Group III (13 cases) Percentage	Group IV (25 controls) No. of cases	Group IV (25 controls) Percentage
1.	Villous vascularity								
	— Normal	3	50.0*	4	66.6	10	76.9	22	88.0
	Increased	1	16.7	1	16.7	2	15.4	3	12.0
	— Decreased	2	33.3**	1	16.7*	1	7.7	0	0.0
2.	Endarteritis obliterans	5	83.3*	5	83.3*	6	46.1	8	32.0
3.	Basement membrane thickening	6	100.0***	5	83.3**	9	69.2**	6	24.0
4.	Vasculo- syncytial membranes/ 100 villi								
	Less than 6%	3	50.0*	2	33.3	3	23.1	3	12.0
	6—30%	3	50.0	4	66.7	10	76.9	21	84.0
	More than 30%	0	0.0	0	0.0	0	0.0	1	4.00
5.	Syncytial knots/ 100 villi								
	Less than 30%	0	0.0***	2	33.3**	9	69.2	21	84.0
	30—50%	4	66.7**	3	50.0	4	30.8	4	16.0
	More than 50%	2	33.3**	1	16.7*	0	0.0	0	0.0
6.	Villous stromal fibrisis	6	100.00	6	100.0	12	92.3	19	76.0
7.	Fibrinoid necrosis	5	83.3	5	83.3	10	76.9	19	76.0

* $P<0.05$, statistically significant.
** $P<0.01$, moderately significant.
*** $P<0.001$, highly significant.
Others — insignificant.

in vascularity of placentae from pre-eclamptic cases.

Endarteritis obliterans was observed in 32% placentae in controls. There was marked statistically significant ($p < 0.05$) increase in pre-eclampsia and eclampsia (83.33%) each. Endarteritis obliterans was seen in 46.15% cases of mild pre-eclampsia. These findings are in agreement with those of Paine (1957), Sauramo (1961), Fox (1967), Salvatore (1968) and Mathews *et al* (1973).

The presence of abnormally thick basement membrane was observed in 24% of control subjects. A notable increase ($p < 0.01$) in the villi with thickened basement membrane was observed in cases of toxaemia (100% in cases of eclampsia, 83.3% in severe pre-eclampsia and 69.23% in mild pre-eclampsia). Similar findings were observed by Tenney and Parker (1938), Tenney and Parker (1940), Hall (1949), McKay and Hertig (1957), Meharotra *et al* (1972) and Bhatia *et al* (1981). The cause of basement membrane thickening is unknown but it is considered to occur as a response to uteroplacental ischaemia (Fox, 1978). The actual mechanism by which ischaemia induces basement membrane changes is not clear but it may be related to cytotrophoblastic hyperplasia which also occurs under ischaemic conditions.

There was also decrease in count of vasculosyncytial membranes in toxaemic patients which was not more than 30% in any toxaemic case. Less than 6% vasculosyncytial membranes were seen in 50% of eclamptic cases which is significantly ($p < 0.001$) different from 12% in healthy controls. This finding is in agreement with the findings of Becker and Bleyl (1961), Mathews *et al* (1973), Fox (1978) and Kher *et al* (1981). This finding is supported by the fact that a deficiency of vasculosyncytial membranes in the mature placenta is associated with high incidence of foetal hypoxia (Fox, 1967).

Syncytial knot counts per 100 villi were less than 30% in 84% of contrlos. The counts were found to be significantly increased in cases of eclampsia ($p < 0.001$) and severe pre-eclampsia ($p < 0.001$). These findings coincide with those of Mathews *et al* (1973) and Sayeed *et al* (1976). Several theories are based on the supposition that increased syncytial knots are a result of toxaemia of pregnancy and thus a manifestation of the degenerative process in placenta.

There was increase in the incidence of villous stromal fibrosis and fibrinoid necrosis in toxaemia cases which, however, was not statistically significant as compared to controls. Villous stromal fibrosis is attributed to normal ageing process and reduced uteroplacental blood flow due to endarteritic changes in blood vessels.

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See Fig. on Art Paper II