

PLACENTAL MORPHOLOGY AND FOETAL GROWTH IN NORMAL AND ABNORMAL PREGNANCIES

by

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SUMMARY

This is a morphological study of 206 placentae.

Introduction

The association between placental weight and foetal weight has been recognised over a century. Deviation of intrauterine growth has long been attributed to the dysfunction of placenta. Structural derangements of the placenta evoke considerable interest, as these may be the only yard stick to measure the adequacy of foetal environment.

It is surprising that, macroscopic examination of placenta has been so scarcely reported in Indian literature, considering the ease with which it can be done and the quantum of information it can supply in evaluating the neonate.

This is a study of the placenta of normal and abnormal pregnancies and a correlation of its role in causation of foetal growth retardation.

Material and Method

A morphologic study of placentae of 200 deliveries was done. Total number of placentae were 206, which included placentae of twin pregnancies.

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Examination of the mother was done for any evidence of abnormal pregnancy. Placentae were examined macroscopically for shape and configuration, dimension (i.e. diameter and thickness), weight, foetal surface, tessellations, and subchorionic fibrosis. Maternal surface of placentae were examined for number of cotyledons and its separation, Nitabuch's layer, calcification, infarction, colour and retroplacental hematoma. Membranes were looked for oedema or whether they were unhealthy (blackish, friable and lusterless). Umbilical cords were examined for its length, insertion, knots (false or true), loops, and number of vessels.

Babies were examined for gestational age, weight, height, sex and congenital malformation. The babies were divided as per intra-uterine growth charts (1) into 4 groups as follows:

Normal full term babies (93 cases), preterm babies (72 cases), small for date babies (25 cases) and large for date babies (10 cases). Morphology of placenta in each group was studied.

Feto-placental ratio (F/P) was determined by:

Weight of baby in gm.

Weight of placenta in gm.

Results

Shape of placenta was round in 81.6%, oval in 16.0%, and irregular in 2.4% of cases. Oval or round placenta had no clinical significance. Irregular placenta was seen in prematurity due to toxæmia, severe anaemia and Rh incompatibility.

Size of the placenta ranged between 10-23 cm (mean 17.95 cm) in diameter and 1.2-2.5 cm (mean 1.59 cm) in thickness. Size of placenta is not important as is the weight of placenta (Table I). Also foetal size and placental blood flow are not explained by placental size.

F/P ratio for preterm is lower than that for full term babies. Placenta for small for date (SFD) babies is small and this low

weight placenta as causative factor for SFD babies has been documented. Also placental infarct, retroplacental hematoma, circumvallate placenta, long umbilical cord and other placental abnormalities have important bearing in causation of low birth weight babies.

Table II shows that male babies are heavier than the female babies and at given birth weight male placenta tends to be slightly heavier than female placenta. It is presumed that endocrine factor is responsible for sex weight difference.

Table III shows that the weight of placenta, weight of the baby and F/P ratio increase with the weeks of gestation. All these parameters are reduced in cases of premature deliveries and increase in post maturity and mothers having diabetes mellitus.

Placental weight increases from 441 gm at 32 weeks to 541 gm at 40 weeks of

TABLE I
Relationship Between Placental Weight and Foetal Growth

Foetal Growth	No. of cases	Mean Placental weight in gm.	Mean weight of baby in gm.	F/P Ratio
Pre/term	93	522.0	2813.7	5.39
Full term	72	431.7	1942.6	4.50
Small for date	25	420.0	1999.2	4.76
Large for date	10	680.0	3300.0	4.85
		497.4	2472.2	4.97

TABLE II
Relation Between Sex of the Baby, Placental Weight Birth Weight and F/P ratio

Sex of Baby	No. of cases	Mean placental weight in gm.	Mean weight of baby in gm.	F/P Ratio
Male	97	472.4	2557.3	5.41
Female	111	518.1	2394.1	4.62

TABLE III
Relationship Between Gestational Age, Placental Weight Birth Weight and F/P Ratio

Gesta- tional age in weeks	Mean placental weight in gm.	Mean birth weight in gm.	F/P Ratio
28	280	1116.6	3.98
30	435	1687.5	3.87
32	441	2160.0	4.89
34	446	2395.5	5.37
36	476	2613.6	5.49
38	496	2649.7	5.34
40	541	2932.4	5.42
42	680	3300.0	4.85

gestation. This co-relates with Das Gupta (1951) who observed 400 and 450 gms respectively. While the figures of F/P ratio increase from 4.89 to 5.42, compare well with Thomson (1969) who showed increment from 4.0 to 5.26. Thus, as the pregnancy advances, weight of the placenta in relation to foetus becomes low.

ratio of 5:1, and in 93.2% of total cases it ranged between 4:1 to 6:1. But at ratio 5:1 only 68.3% were full term babies while at 7:1 and 8:1 all babies were full term. Incidence of preterm babies and still birth was higher at ratio between 1:1 to 3:1. Thus as F/P ratio increases from 1:1 to 8:1, the incidence of premature deliveries decreases and that of foetal survival increases.

Largest placenta in our series was 1050 gm in a primiparous mother with antepartum hemorrhage with hydramnios, with velamentous insertion, and the baby delivered as still born having 1700 gm weight. Largest placenta recorded in the literature, is of 1650 gm as reported by Chavingney (1957). It was without any abnormality and without any pathological cause like diabetes or erythroblastosis foetalis.

Number of cotyledons ranged from 6 to 35, the mean being 15. It was not related to the maturity of foetus.

TABLE IV
Relation Between Age of the Mother, Placental Weight, Birth Weight and F/P Ratio

Age of mother in years	No. of cases	Mean placen- tal weight in gm.	Mean birth weight in gm.	F/P Ratio
15-20	46	474.0	2251.1	4.75
21-30	146	496.9	2499.0	5.03
31-40	8	558.9	2855.6	5.11

Mean placental weight, birth weight and F/P ratio increase with the age of the mother. Similarly, birth weight and placental weight increase with the parity of the mother, but F/P ratio almost remains the same and does not increase with parity.

F/P ratio in present study ranged from 1:1 to 8:1. But 53.8% of cases had the

Calcification of placenta is an aging process. It was not seen in premature placentae less than 32 weeks of gestation and was most marked in postmature placenta. The calcification also increases with the age of mother and parity; 48.3% of primiparous placentae as compared to all placentae above 5th para showed calcification.

Nitabuch's layer was absent in premature placentae. Tesselation and subchorionic fibrosis are also due to placental aging, and these changes were scarce in premature placentae.

Placental infarcts were looked for on maternal surface of placentae. Present series showed placental infarcts in 23.8% of cases of which 53.1% had toxæmia. Other causes were severe anaemia, diabetes, postmaturity and prematurity. The incidence of placental infarcts was 27.8% in the series of Wallenberg and Stollate. They observed that even smallest infarct, influences the placental and foetal weight. In very few cases, severe infarction leads to placental insufficiency and death of the foetus.

Length of umbilical cord in present study varied between 18.0 to 70.0 cm, mean being 41.6 cm. Eastman (1966) observed shortest cord of 0.5 cm and longest of 198 cm. Figures of Rohatgi *et al* (1974) were 25.5 cm and 108 cm respectively with the mean length 58.1 cm. Range of umbilical cord length from achordia upto 300 cms has been reported.

Eccentric insertion of cord (56.6%) was more common than central insertion (40.4%). The figures of Mukherji *et al* (1971) were 69.2% and 20.4% respectively. They observed marginal insertion in 10.4% of cases and velamentous insertion in none.

In the present series, 2 cases of marginal insertion and 4 cases of velamentous insertion were observed. All 6 cases had preterm deliveries and 50% of them had antepartum hemorrhage. Also 2 cases of circumvallete placenta and 1 of extra lobe of placenta was seen.

No case of true knot of the cord was seen. Other authors have observed it in the range of 0-1.1%.

In the present study, 1 loop of cord was

present in 2.88%, 2 loops in 0.96% and 3 loops in nine. The figures of Eastman (1966) are 20.6%, 2.5% and 0.2% respectively.

Two cases of single umbilical artery were seen, both still born—one was anencephalic, while other had hydrocephalus with spina bifida. Incidence of single umbilical artery, observed by Mukherji *et al* (1971) and Rohatgi *et al* (1974) is 0.48%, and 4.0% respectively. Incidence of single umbilical artery is reported higher in twin pregnancies in range of 5-6% of twins. In the present study none of the twins showed single umbilical artery.

Colour of placenta was red in full term, mild pallor was present in mild to moderately anaemic mother's placenta and marked pallor was seen in several cases of severe anaemia, toxæmia, diabetes and prematurity. Unhealthy membranes were seen in cases of severe anaemia and prematurity.

Meconium stained membranes were seen in 22 cases. It was associated with toxæmia in 10 cases, loop of cord around the neck in 9, severe anaemia in 6, postmaturity in 2, diabetes in 1 and no identifiable cause in 3. Total number of causes here is more than total number of cases, because in 7 cases more than one factor was responsible. Twenty of these 22 cases showed placental infarcts.

Incidence of abnormal pregnancies in the present series was as follows: Toxæmia 37 cases, anaemia (Hb less than 8 gm%) 44 cases, Rh incompatibility 12 cases, multiple pregnancy (Twins) 8 cases and mother having jaundice and diabetes mellitus 1 case each.

Weight of placenta and birth weight are more in pre-eclampsia with oedema than that without oedema. But in severe pre-

TABLE V
Placental Morphology and Foetal Outcome in Mothers Having Toxaemia

	Pre-eclampsia		Eclampsia %
	Moderate %	Severe %	
	(n = 23)	(n = 13)	(n = 1)
Placental Weight-gm.	507.0	480.0	420.0
Birth Weight-gm.	2566.0	2257.0	2000.0
F/P Ratio	5.06	4.70	4.76
Placental infarction	52.2	76.9	100
Pre-term	32.0	28.5	100
Still Birth	8.0	21.4	—

eclampsia both will decrease probably due to marked proteinuria. *Comments*

Thus mean placental weight, birth weight, F/P ratio decrease and foetal outcome deteriorates with increasing severity of toxaemia.

Anaemic group had more placental weight and less birth weight. Thus placental hypertrophy is mainly due to placental hypoxia.

In the present study incidence of multiple pregnancy was 8, and all of them were twins i.e. from the 8 mothers 14 placentae, 16 cords and 16 babies were examined. Of the 8 twins, 6 were dizygotic of which 3 had different sex and 3 had same sex. Rest 2 were monozygotic, diamniotic twins (of same sex) of which none had the evidence of twin-to-twin transfusion.

Placentae of Rh incompatibility were pale and large. None of the babies presented with hydrops foetalis or developed severe jaundice in neonatal period. Placenta of diabetic mother was pale, infarcted and meconium stained. Fox and Jone (1969) studied 7 cases of diabetes in pregnancy and found the mean placental weight of 577 gms. Both babies of placenta previa were delivered prematurely at 8 months of gestational age.

Placental shape showed no co-relation with foetal growth. F/P ratio was lower for preterms as compared to full term infants. This has also been reported by several workers (Bhargava *et al* 1983; Desai *et al* 1974; Saigal and Srivastava 1970). I.U.G.R. has also been associated with small placenta, probably due to impairment of circulation.

The placental weight and F/P ratio in the present study increased with the advancement of gestation. Difference of 90 gm in the placental weight of preterm and term babies, and difference upto 260 gm, when compared to lighter and heavier babies was observed. Similar figures of Saigal and Srivastava (1970) were 130 gm and 300 gm respectively. In the present study, F/P ratio for preterm and full term babies was 4.50:1 and 5.39:1. The figures of Bhargava *et al* were 6.0 and 6.66 respectively.

Placental infarcts and calcification were found more frequently in SFD babies as compared to other groups. The occurrence of placental hemorrhage was high in all the groups of preterm, SFD and large for date babies.

Sub-chorionic fibrosis was more severe

with SFD babies. Long cord and massive separation of cotyledons were associated with large for date babies.

Examination of membranes for oedema, opaque or yellow discoloration revealed no significant findings.

The examination of umbilical cord revealed no significant co-relation with cord insertion, false or true knots or looping.

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