Morphological Study of Human Placenta in Normal and Hypertensive Pregnancy

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Abstract

Introduction: The normal human placenta is a dynamic discoid organ which has two surfaces; one the chorionic plate facing the foetus (the umbilical cord attached) and 2. The basal plate which about the maternal endometrium. Human placenta has drawn attention as valuable information regarding foetal & maternal diseases. As placenta guide the intra uterine status of the foetus, study of the placenta will give an accurate condition of the foetal outcome. The aim of this study was to study the morphology of placenta with normal & hypertensive mother.

Subjects and Methods: This present study was carried out in the Dept. of Anatomy, Smt. B. K. Shah Medical institute & Research Centre, in association with the dept. of OB & GY of Dhiraj hospital, Piparia, Waghodia, Vadodara district. A total number of 100 (Hundred) placenta (50 - fifty hypertensive mother + 50 - fifty normal mother) with 5cms length of umbilical cord were collected from the Obstetric dept. and relevant medical history (H/O) related of the mother were noted and recorded from the data available in the hospital record section.

Results and Conclusion: In this present study group comprised human placentae from fifty (50) pregnancies with hypertensive mother. The control group comprised fifty (50) human placentae from pregnant mothers with normal blood pressure, without proteinuria and without edema. Among study group most common pregnancy comprised pre-eclampsia (50%) in this study. The mean age of hypertensive mothers were 25.9 ± 2.5 years in this present study. The mean age of non-hypertensive mother were 25.1 ± 3.21 in this present study.

Keywords: Placenta, hypertension, pregnancy, Morphology

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Introduction

The human placenta is a dynamic discoid organ which has two surfaces; one the chorionic plate facing the foetus (umbilical cord attached) & the basal plate which about the maternal endometrium (Wang et al., 2004; Sørensen et al., 2013). It is the only organ in the body from two separate individuals, first from mother and second from the foetus and is the primary metabolic regulator for the respiratory system, excretory function, nutritional deficiency, endocrine and immunological functions of the foetus necessary for the foetal growth, Raghunath & Vijayalakshmi et al .2011; Singal et al., 2013.

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The normal human placenta at term pregnancy has a dark blue red colour / maroon colour and weighs about 590 grams and is appx. 20 to 25 cm in diameter and 3 cm thick. Tissot van Patot et al., 2009; Heazell et al., 2010. These morphological measurements can vary considerably due to many factors including pathological and physiological factors, Janthanaphan et al., 2006; Kaplan, 2008. The normal weight of the placenta has been varied over the years but recent studies show that it has an average weight of about 590 grams with a range of 350 to 750 grams Panti et al., 2012; Lakshmi et al., 2013. It has been shown that placental weight has a significant role in foetal growth in terms of weight, body length, and cord length but it has no significant role in the presence of meconium - stained fluid Lo et al., 2002. Little et al. (2003) reported that absolute measures of infant size and placental weight had mutual positive correlation.

Placenta drawn attention towards valuable information related to foetal & maternal diseases. Eskild A,Vatten LJ, many disorders related to pregnancy which are associated with high risk perinatal morbidity & mortality, shown gross pathological changes in human placenta. Many maternal diseases and disorders bring about to notice for changes in placenta at morphological and microscopic level. Abnormal results of placenta adversely affects the fetal outcome. Udaina.A & Majumdar S, as placenta is the mirror of maternal and foetal outcome, complications in pregnancy has been reflected in the placenta in a significant way both macroscopically & microscopically.
As placenta guide the condition of intra uterine status of the foetus, study of the placenta give an accurate outcome of the foetal condition (Manik Sirpurkar et al.,199). Benirschke. K & Carolyn M, life threatening complications of human pregnancy like gestational diabetes, iron deficiency anaemia, hypertension & intra uterine growth retardation (IUGR) result in both macroscopic as well as microscopic changes in the placenta.20,21 Maternal hypertension, a global epidemic in 21 stcentury pregnancy complication & became one among the deadly triad along with hemorrhage and infection in pregnancy resulting in large number of maternal deaths and there off fetal deaths. Choe Jing Jye, PIH (Pregnancy induce Hypertension) is a pregnancy specific, multi-systemic disorder characterized by hypertension, edema and proteinuria after twenty weeks (20 weeks) of gestation.22 Emery SP, pregnancy complicated by hypertension is commonly associated with placental insufficiency.23 Bewly S, has recorded that maternal utero-placental blood flow is reduced in pre-eclampsia because there is maternal vasospasm.24 Hypoxia in inter-villus space due to reduction of blood flow in placenta & myometrium is involved in the mechanisms of morphological alterations of the placenta because of maternal hypertension (Alvarez H et al.).25

The feature of abnormal placentation in PIH (Pregnancy induce hypertension) is inadequate trophoblastic invasion of the maternal spiral arteries that results in persistence of persistent hypertension (Alvarez H et al.).25

Subjects and Methods

This present study was conducted in the dept. of anatomy, Smt. B.K. Shah Medical institute & Research Centre with dept. of OB & GY of Dhiraj hospital, Piparia, Vadodara. A total no. of 100 (Hundred) placenta (50- Fifty hypertensive mother + 50- fifty normal mother) with Five (5) cms length of umbilical cord of studied subjects were collected from the Obstetrics dept. & relevant medical history of the mother were noted from the data available in the Hospital record section.

The studied specimens of placenta and cord were brought to the dept. of anatomy. The placenta and cord washed with water to remove the blood clots & make them dry. The following data were recorded for the study (Weight, Consistency, Shape Cord attachment, Thickness of placenta is measured by inserting the fine needle through & through and measured upto nearest millimeters, Diameter of the placenta is measured by taking as average of the diameter with measuring tape). There were present or absent (hematoma, calcification, infarction) noted.

The study group comprised placenta from fifty pregnancies with hypertension. The control group comprised fifty placentae from pregnant mothers with normal blood pressure, without proteinuria and without edema. Among study group most common pregnancy comprised pre-eclampsia (50%).

Results

In present study hypertensive mother group (study group), maximum number of placentae were from the Pre eclamptic mothers.

Table 1: Distribution of study group

| Type of Pregnancy          | No. of Cases | Percentage (%) |
|----------------------------|--------------|----------------|
| Gestational Hypertension   | 13           | 26%            |
| Pre-eclampsia              | 25           | 50%            |
| Eclampsia                  | 12           | 24%            |
| Total                      | 50           | 100%           |

The mean age of hypertensive mothers was 25.9 ± 2.5 years. The mean age of non-hypertensive mother was 25.1 ± 3.21.

Table 2: Comparison according to maternal age.

| Age Group (Years) | Hypertensive (Study) | Normal (Control) |
|-------------------|----------------------|------------------|
| 20-24             | 16                   | 12               |
| 25-29             | 24                   | 30               |
| 30-35             | 10                   | 08               |
| Total             | 50                   | 50               |
| Mean ± SD         | 25.9 ± 2.5           | 25.1 ± 3.21      |

Table 3: Distribution related to parity.

| Parity     | Hypertensive Mothers | Normal mothers | Total |
|------------|----------------------|----------------|-------|
| Primi      | 40                   | 38             | 78    |
| Multi      | 10                   | 12             | 22    |
| Total      | 50                   | 50             | 100   |

Above table suggest maximum no of hypertensive mothers were primi para and also maximum no in normal mothers. There was no significant difference between this two groups.
The above table suggests that hypertensive mothers delivered 56 % vaginal, 44 % LSCS and non-hypertensive mothers delivered 72 % vaginal, 28 % LSCS. In hypertensive mother’s 38 % pre term and 62 % Term baby and in non-hypertensive mothers 02 % pre term and 98 % term baby. In hypertensive mothers 90 % live birth and 10 % intra uterine death and in non-hypertensive mothers 100 % live birth.

The above table suggests that placenta of hypertensive mother was 58 % discoid in shape and non-hypertensive was 98 % discoid in shape. In hypertensive mother hematoma present in 16 % and in non-hypertensive hematoma were absent. In hypertensive mother infarction were present in 80 % cases and in non-hypertensive present in 2 % cases. In hypertensive mother calcification present in 46 % and in non-hypertensive present in 16 % cases.

**Table 5: Gross morphology of Placenta**

| No | Features of Placenta | Component | Hypertensive | Non hypertensive | Significance |
|----|----------------------|-----------|--------------|-----------------|--------------|
| 1  | Shape                | Discoid   | 29           | 58%             | 29           | 49           | 98%            | P < 0.01       |
|    |                      | Irregular | 21           | 42%             | 21           | 01           | 02%            | P < 0.05       |
| 2  | Hematoma             | Absent    | 42           | 82%             | 42           | 00           | 00%            | P < 0.001      |
|    |                      | Present   | 08           | 16%             | 08           | 00           | 0              | P < 0.01       |
| 3  | Infarction           | Absent    | 40           | 80%             | 40           | 02           | 02%            | P < 0.01       |
|    |                      | Present   | 10           | 20%             | 10           | 02           | 04%            | P < 0.01       |
| 4  | Calcification        | Absent    | 27           | 54%             | 27           | 02           | 04%            | P < 0.01       |
|    |                      | Present   | 23           | 46%             | 23           | 08           | 16%            | P < 0.01       |

Discussion & Conclusion

The present study was conducted in the department of Anatomy, Shree B.K. Shah Medical institute & Research Centre, in collaboration with the Department of Obstetrics and Gynecology of Dhiraj hospital, Piparia, Vadodara. A total number of 100 placenta (Fifty hypertensive mother + fifty normal mother) with 5cms length of umbilical cord were collected from the Obstetrics department and relevant medical history of the mother were noted from the data available in the Hospital records.

Pregnancy induced hypertension adversely affects the morphology of placenta. Placenta brings the mother and fetus, the two important ends of reproduction in contact with each other. Therefore the placenta which is usually considered as records of infant’s prenatal experience provides crucial information about the deleterious effects of pregnancy induced hypertension on fetal outcome. Teenage pregnancy and primi gravida were risk factors for preeclampsia and eclampsia the prevalence of pre-eclampsia (50%) and eclampsia (24%) in this study [Table 1] Shiva shree ranga et al found similar finding of hypertensive pregnancies.

The prevalence of infarction of placenta of hypertensive mother were 20 % and in non-hypertensive mother were 02 %.

Udaima et al and Majumdar and Correa et al found similar finding in their studies.

References

1. Wang, W. S., Liu, C., Li, W. J., Zhu, P., Li, J. N. and Sun, K. (2014). Involvement of CRH and HCG in the induction of aromatase by cortisol in human placental syncytiotrophoblasts. Placenta, 35(1): 30-36.
2. Sorensen, A., Peters, D., Friënd, E., Lingman, G., Christiansen, O. and Uldbjerg, N. (2013). Changes in human placental oxygenation during maternal hyperoxia estimated by blood oxygen level-dependent magnetic resonance imaging (BOLD MRI). Ultrasound in Obstetrics and Gynaecology, 42(3): 310-314.
3. Raghunath, G. and Vijayalakshmi, V. S. (2011). A study on the Morphology and the Morphometry of the Human Placenta and its Clinical Relevance in a population in Tamilnadu. Journal of clinical and diagnostic research, 5(2): 282-286.
4. Singal, D. R., Sarvaiya, D. J. and Patel, S. V. (2013) Placental Morphometry in Relation to Birth Weight of Full Term Newborn. Southeast Asian Journal of Case Report and Review, 2(5): 334-342.
5. Tissot van Patot, M. C., Valdez M., Becky V., Cindrova-Davies T., Johns J., Zwervering L., Jauniaux E. and Burton G. J. (2009). Impact of Pregnancy at High Altitude on Placental Morphology in Nonnative Women with and Without Preeclampsia. Placenta, 30(6): 523-528.
6. Heazell, A., Cotter, S., Gallimore, L., Greenhalgh, D., Kennedy, S., Klika, V., Kritz, M., Nielsen, P., Preedy, K., Pu, I., Sethi, A., Siggers, J. and Whittaker, R. (2010). Comparing placentas from normal and abnormal pregnancies.
7. Janthanaphan, M., Korn-Anantkul, O. and Geater, A. (2006). Placental weight and its ratio to birth weight in normal pregnancy at high altitudes. Southeast Asian Journal of Obstetrics and Gynecology, 42(3): 130-137.
8. Kaplan, C. G. (2008). Gross Pathology of the Placental Weight, Shape, Size, Colour. Journal of Clinical Pathology, 61(12): 1285-1295.
9. Panti, A. A., Ekele, B. A., Nwobodo, E. I. and Yakubu Ahmed (2012). The relationship between the weight of the placenta and birth weight of the neonate in a Nigerian Hospital. Nigeria Medical Journal 2012 April-June, 53(2): 80–84.
10. Lakshmi, D. C. K., Shashank, N. and Raghupathy, N. S. (2013). Morphological Studies of Normal Human Placenta at Different Gestational Periods. Journal of Dental and Medical Sciences, 6(3): 2279-0861.
11. Lo, Y. F., Jeng, M. J., Lee, Y. S., Soong, W. J. and Hwang, B. (2002). Placental weight and birth characteristics of healthy singleton newborns. Acta Paediatr Taiwan, 43(1): 21-25.
12. Little, R. E., Zadorozhnaia, T. D., Hukhly, O. P., Mendel, N. A., Shkyryak-Nyzhnyk, Z. A., Chyslovska, N. and Gladen, B. C. (2003). Placental weight and its ratio to birthweight in a Ukrainian city. Early Human Development Journal, 71(2): 117-127.
13. Tangirala S., Kumari D. Placental morphology in hypertensives disorders and its correlation to neonatal outcome. IAIM, 2015;2(11):35-38.
14. Eskild, A. Vatten LJ. Do pregnancies with PE havesmallplacentas? A
population study of 317688 pregnancies with & without growth restriction in theoffspring. BJOG. 2010; 117:1521-1526.
15. Udaina A, Bhagwat SS, Mehta CD. Relation between placental surface area, infarction and foetal distress in pregnancy induced hypertension with its clinical relevance. J AnatSocInd 2004;53;1:27-30.
16. Majumdar S, Dasgupta H. A Study of Placenta In Normal And Hypertensive Pregnancies. J AnatSocInd 2005;54:1-9.
17. Cavellani, Marina C. Paschoini, Flávia A. Oliveira, Luís C. Peres, Marlene A. Reis, Vicente P. A. Teixeiraand Eumenia C. C. Castro Placental morphometrical and histopathology changes in the different clinical presentations of Hypertensive Syndromes in Pregnancy. Arch Gynecolobstr 2008;277(1):201-206.
18. Kurdukar MD, Deshpande NM. Placenta in Pregnancyinduced Hypertension. Indian J PatholMycrobio1 2007;50:493-497.
19. Manik Sirpurkar, Vaibhav Prakash Anjankar. Studyof correlation between placental morphology and adverse perinatal outcome in different conditions affecting pregnancy. Int J Reprod Contracept ObstetGynecol. 2015;4(4):1165-1168.
20. Benirschke K, Kaufmann P, Baergen R. Pathology ofthe Human Placenta. 5th edition, Vol.Chapter 7 Architecture of normal villous trees, New York. Springer Verlag 2006:121-159.
21. Carolyn M. Salafia, Michael Yampolsky, Dawn PMisra, Oleksander Shlakhter, Danielle Haas, Barbara Eucker, and John Thorp. Placental surfaceshape, function, and effects of maternal and fetal vascular pathology. Placenta. 2010;31(11): 958–962.
22. Choe Jing Jye. Challenges of obstetricians in themanagement of severe preeclampsia.Obs andGynaec today. 2009; 16(8): 348-51.
23. Emery SP. Hypertensive disorders of pregnancy.Overdiagnosis is appropriate. Cleveland Clin J Med. 2005; 72(4): 21-28
24. Bewly S, Coper D, Campbell S. Doppler investigation of uteroplacental blood flow resistance in thesecond trimester. A screening study for preeclampsia and intrauterine growth retardation. BJ Obst and Gynecol. 1991; 98: 871-79
25. Alvarez H, Medrano CV, Sala MA, BenedettiWL. Trophoblast development gradient and its relationship to placental hemodynamics II.Study offetal cotyledons from the toxemic Placenta. Am J Obstet Gynecol. 1972; 114: 873-78
26. Segupta Kishwara, Shamim Ara, Khandaker Abu Rayhan, Mahamuda Begum. Morphological Changes of Placenta in Preeclampsia. Bangladesh Journal of Anatomy January 2009; 7(1): 49-54.
27. Zhou Y, Danisky C.H, Fisher S.J. Preeclampsia is associated with failure of human cytotrophoblast to mimic a Vascular Adhesion Phenotype J. Clin. Investigation. 1997; 99 (9): 2152-2164.
28. Udaina A, Bhagwat SS, Mehta CD. Relation between placental surface area, infarction and foetal distress in pregnancy induced hypertension with its clinical relevance. J Anat Soc India 2004;53:27-30.
29. Majumdar S, Dasgupta H. A study of placenta in normal and hypertensive pregnancies. J Anat Soc India 2005;54:1-9.
30. Corrêa RR, Gilió DB, Cavellani CL, Paschoini MC, Oliveira FA, Peres LC, et al. Placental morphometrical and histopathology changes in the different clinical presentations of hypertensive syndromes in pregnancy. Arch Gynecol Obstet 2008;277:201-6