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Research Article

A study on morphology of placenta and umbilical cord in Hypertensive pregnancy with and without Proteinuria

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Abstract

Objectives : Pregnancy induced hypertension is a common pathological condition related to pregnancy. It may be expressed with & without proteinuria. The PIH without proteinuria is a precondition before onset of true preeclampsia. The prime objective of the study is to compare & evaluate the morphological alteration of placenta and umbilical cord in pregnancy induced hypertension with and without proteinuria.

Methods: A Total sample of 80 placenta from hypertensive mothers were collected for the study, with proteinuria & without poteinuria of 40 samples each. Of the total parameters observed ,Baby weight, gestational age, APGAR scores were noted from the Patient case sheet. The placental Weight , volume, cotyledon, diameter, feto placental ratio,& thickness, & the Umbilical cord insertion site, length, coiling index, & diameter were measured and compared statistically by using t- test.

Results: It was observed that, out of the total parameters, The Baby weight, The Placental volume, weight , thickness of center and margin, gestational age, feto placental ratio varies significantly between preeclampsia group (With Proteinuria) & gestational hypertensive group (Without Proteinuria).In the rest of the Parameters no material variations were observed statistically (ie: Diameter & Cotyledon of Placenta, APGAR scores & the umbilical cord dimensions – cord length, diameter at 3 sites, coiling index, site of insertion)

Conclusions: The study reveals that, the alteration of morphological parameters of placenta have a main role in the increased functional insufficiency and associated fetal growth retardation in the progress of hypertensive condition from gestational hypertension to preeclampsia.

Keywords: Pregnancy induced hypertension, gestational hypertension, preeclampsia, placenta, umbilical cord

1. Introduction

Placenta is a vital organ which supports the developing fetus, in nutrition, respiration & excretion. It is an indicator of fetal growth progress. The proper fetal growth is determined by the weight of placenta[2,14]. Impaired function of placenta adversely affect the fetal outcome [6]. Pregnancy induced hypertension (PIH) is a common pathological condition, related to pregnancy and increased risk of mortality and morbidity were proved among fetus with hypertensive mother's [10]. Hypertension in pregnancy is associated with poor blood supply to the inter villous spaces of placenta[12]. The inadequate supply of blood to placenta, of PIH group, leads to Placental Abruption , IUGR and Preterm Birth[19,1,22,25]. Such deficiency in placenta will leads babies to reduced birth weight and are more prone to acquire hypertension in later life[11]. PIH can be expressed with proteinuria and without proteinuria. The PIH without proteinuria is a precondition before onset of true preeclampsia[18].The aim of the present study was to compare the morphometric parameters of placenta and umbilical cord

between gestational hypertension (PIH without proteinuria) and preeclampsia(with proteinuria).

2. Materials and methods

Total number of 80 hypertensive placentas were used for the present study, out of which 40 were without proteinuria (gestational hypertension) and 40 with proteinuria (preeclampsia). placentae was collected from Department of Obstetrics and Gynecology in Government Hospital for women and children in Egmore, Chennai ,after obtaining due consent from patients and approval from ethical committee . Gestational hypertensive group comprised of , Mother with BP ≥ 140/90mm Hg occurred for the first time during pregnancy , no proteinuria & edema ,BP returns to normal<12 weeks of postpartum, whereas in preeclampsia group - BP≥140/90mm Hg after 20 weeks of gestation with proteinuria & edema. Chronic hypertension, renal failure, cardiac problems, gestational diabetes mellitus and multiple pregnancy were excluded.

The collected placentae were squeezed to evacuate the blood and washed under running tap water .The membranes were trimmed, the length of the umbilical cord was measured, the site of insertion of the umbilical cord was also noted .The placentae were weighed by cutting the umbilical cord at a distance of 2cm from its site of insertion. The volume of the placentae were determined by water displacement method. The number of Cotyledons were counted from maternal side. The diameter of the placentae were calculated by taking the mean value of the shortest & longest diameter of placenta. Thickness was measured by inserting a needle into the placenta, 2cm away from margin and 1cm from centre, respectively. The Measurements were taken from four clock positions (12, 3, 6 and 9 o'clock) and the mean value was taken for analysis. Circumference of cord were measured in three areas- maternal end, middle & fetal end by using thread, coiling index and feto-placental ratio was calculated.

Statistical Method: Data were analyzed and compared by using student t-test.

3. Results

The Baby weight, Placental volume, weight, and thickness in both center and margin, Gestational age were significantly reduced & feto placental ratio were significantly increased in preeclampsia group. But the other parameters like diameter & cotyledon of placenta, APGAR scores, even though it showed differences in its values it was not significant statistically. The umbilical cord dimensions – cord length, diameter at 3 sites, coiling index, site of insertion- were also not shown any significant changes between two groups. Details are given in the table 1 & 2

Table :1 Morphometry of placenta

Variables		Mean	T Value	P Value	
Baby Weight	GHT	2522.5 ± 569.632	2.4674	0.0158	Significant
	PE	2231.75 ± 480.560			
Placental Weight	GHT	370 ± 88.289	3.51	0.0007	Significant
	PE	308.125 ± 68.028			
Placental volume	GHT	315.75 ± 90.018	2.8354	0.0058	Significant
	PE	266.75 ± 61.992			
Fetoplacental Ratio	GHT	6.85 ± 0.63	2.7088	0.0083	Significant
	PE	7.29 ± 0.81			
Gestational Age	GHT	37.55 ± 1.62	3.2287	0.0018	Significant
	PE	36.1 ± 2.34			
Placental diameter	GHT	15.65 ± 3.48	0.0453	0.964	Not significant
	PE	15.68 ± 1.62			
Cotyledons	GHT	12.65 ± 2.29	0.8813	0.3809	Not significant
	PE	12.15 ± 2.76			

Thickness at Centre	GHT	2.58 ± 0.24	4.0683	0.0001	Significant
	PE	2.26 ± 0.43			
Thickness at Margin	GHT	1.77 ± 0.45	3.5485	0.0007	Significant
	PE	1.48 ± 0.27			
APGAR Score1M	GHT	6.9+0.30382	1.9663	0.0528	Not significant
	PE	6.425+1.58337			
APGAR Score5M	GHT	7.9+0.30382	1.7144	0.0904	Not significant
	PE	7.425+1.82416			

Table :2 Morphometry of umbilical cord

Variables		Mean	T Value	P Value	
Cord length	GHT	30.81+11.79569	0.5393	0.5912	Not significant
	PE	29.465+10.38321			
Diameter-maternal end	GHT	1.165+0.15115	1.2291	0.2227	Not significant
	PE	1.22+0.24411			
Diameter-middle	GHT	1.17+0.16672	0.2341	0.8155	Not significant
	PE	1.155+0.20625			
Diameter-fetal end	GHT	1.17+0.23337	0.1987	0.843	Not significant
	PE	1.16+0.22165			
Coiling index	GHT	0.155+0.03783	0.4472	0.656	Not significant
	PE	0.151+0.03855			
Insertion site	GHT	1.45+0.50383	1.3963	0.1666	Not significant
	PE	1.3+0.4641			

4. Discussion

The fetal growth capacity is determined by placental weight [21,14,9]. Normally, Placental weight and baby weight will increase proportionately, with the progress of pregnancy [17,16,13,3]. The hypertensive pregnancy leads to low birth weight and placental weight [23,8,2,26] . The present study showed a significant reduction in the weight of fetus and placenta. The observed reduction in the gestational age might be one of the reason for the same.

The ratio between placental and fetal weight in uncomplicated pregnancy has been reported as 1:6 [4] but in hypertensive pregnancy it was increased [23,24] . The increased ratio noted in the present study groups also. It means that, the rate of reduction of baby weight were less than that of the rate of reduction of placental weight in preeclampsia. Because, in the pathological condition like hypertension, the placenta worked itsmaximum for its function with limited tissue [5]. Observed a significant change in the thickness of placenta, when the pathology progresses from gestational hypertension to preeclampsia and the reduced thickness of placenta is associated with reduction in birth weight [7]. Placental insufficiency is the cause of preeclampsia associated preterm birth, neonatal morbidity [27], which in turn might be the result of these observed alteration in placental dimensions.

The lean umbilical cord were observed in hypertensive pregnancy by ultrasonographic study [15]. But no significant

changes have been observed in umbilical cord dimensions between the two groups in the study.

5. Conclusions

The study observed that, the morphological parameters of placenta showed a significant changes in the progress of pathology from gestational hypertension to preeclampsia, but there is no significant changes in the dimensions of umbilical cord. Thus the study reveals that, When the degree of pathology progresses from gestational hypertension to preeclampsia, the insufficiency of placental circulation results, which in turn increases the fetal demands. The reduction in placental morphological parameters might be the reason for the reduction in baby growth in preeclampsia.

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Reference

1. Ananth CV, Peltier MR, Kinzler WL, Smulian JC, Vintzileos AM. Chronic hypertension & risk of placental abruption: Is the association modified by ischemic placental disease?. Am J Obstet Gynecol. 2007 Sep;197(3): 273.e 1-7.
2. Asgharnia M, Esmailpour N, Poorghorban M, Atrkar-Roshan Z. Placental weight and its association with maternal and neonatal characteristics. Acta Medica Iranica. 2008; 46(6)467-472.
3. Bonds DR, Gabbe SG, Kumar S, Taylor T. Fetal weight/ placental weight ratio & perinatal outcome. Am J Obstet Gynecol. 1984 May 15;149(2): 195-200.
4. Cunnigham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap LC, Wenstrom KD. Implantation, Embyogenesis & placental development. In: Williams Obstetrics. 22nd ed New York: Mc Graw Hill; 2005: 39-90.
5. Dahlstrom B, Romundstad P, Oian P, Vattan LJ, Eskild A. placenta weight in preeclampsia. Acta Obstet Gynecol Scand. 2008; 87: 608-611.
6. Eskild A,Vatten LJ. Do pregnancies with PE have small placentas? A population study of 317688 pregnancies with & without growth restriction in the offspring. BJOG. 2010;117:1521-1526.
7. Fawzia A Habib MD. Prediction of low birth weight infants from ultra sound measurement of placental diameter and placental thickness. Ann Saudi Med. 2002; 22(5-6): 312-314.
8. Gunapriya Raghunath, Vijayalakshmi, Varsha shenoy. A study on the morphology & morphometry of human placenta & its clinical relevance in a population in tamilnadu. J Clinical Diagnost Research. 2011 Apr;5(2):282-286.
9. Heinonen S, Taipale P, Saarikoski S. Weghts of placentae from small for gestational age infants revisited. Placenta. 2001May; 22(5): 399-404.
10. Jain L. Effect of pregnancy induced & chronic hypertension on pregnancy outcome. J Perinatol.1997Nov-Dec; 17(6):425-427.
11. Johan Eriksson, Tom Forsen, Jaako Tuomilehto, Clive Osmond, David Barker. Fetal & Chid hood growth and hypertension in adult life. Hypertension. 2000; 36: 790-794.
12. Kaauaaur K, Jouppila P, Kuikka J, Luotola H, ToivanenJ, Rekonen A. inter villous blood flow in normal & complicated late pregnancy measured by means of an inter villous 133XE method. Acta obstetricia et Gynecologica Scandinavica. 1980 Jan;59(1): 7-10.
13. Little RE, Zadorozhnaia TD, Hulchiy OP, Mendel NA, Shkyryak-Nyzhnyk ZA, Chysloyska N, Gladen BC. Placental weight and its ratio to birth weight in Ukrainian city. Early Hum Dev. 2003 Apr;71(2): 117-127.
14. Lo YF, Jeng MJ, Lee YS, Soong Wj, Hwang B. Placental weght and birth characteristics of healthy singleton new borns. Acta Paediatr.Taiwan. 2002 Jan-Feb;43(1):21-25.
15. Luigi Raio, Fabio Ghezzi, MD, Edoardo Di Naro, MD, Massimo Franchi, MD, Daniele Bolla MD, Henning Scneider MD. Altered sonographic umbilical cord morphometry in early onset preeclampsia. Obstetrics & gynecology. 2002Aug; 100(2): 311-316.

16. Manop Janthanaphan MD, Ounjai Kor-anantakul MD, AlanGeater PhD. Placental weght and its ratio to birth weight in normal pregnancy at Songkhlanagarind Hospital. J Med Assoc Thai. 2006; 89(2):130-137.
17. Molteni RA, Sty SJ, Battaglia FC. Relationship of fetal & placental weight in humanbeings: fetal/ placental weight ratio at various gestational ages & birth weight distributions. J Reprod Med. 1978 Nov; 21(5): 327-334.
18. Morgan MA, Thurnau GR. Pregnancy Induced hypertension without proteinuria: is it true preeclampsia. South Med J. 1988 Feb; 81(2): 210-213.
19. Naeye RL. Pregnancy hypertension, placental evidence of low uteroplacental blood flow & spontaneous premature delivery. Human Pathology. 1989;20(5):441-444.
20. Papageorghiou AT,Yu CK, Nicolaides KH. The role of uterine artery Doppler in predicting adverse pregnancy outcome. Best Pract Res Clin Obstet Gynaecol. 2004 Jun; 18(3):383-396.
21. Raouf A Khalil, Joey P Granger. Vascular mechanism of increased arterial pressure in preeclampsia: lesson from animal model. Am J Physiol Regul Integr Comp Physiol. 2002; 283:R29-R45.
22. Robert Resnik MD. Intra uterine growth restriction High- Risk pregnancy series: An expert view. American college of obstetricians & Gynecologist. 2002 Mar; 99(3) : 490-496.
23. Shinya Imada, Kimiyo Takagi, Akihiko Kikuchi, Kaori Ishikawa, Shunsuke Tamaru, Tsuguhiro Horikishi, Yoshifumi Ogiso. Birth weight placental weight ratio of appropriate for dates & light for dates infants in preterm delivery. J Obstet Gynaecol Res. 2012 Jan; 38(1): 122-129.
24. Thame M, Osmond C, Wilks RJ, Bennett FI, Farlane Anderson N, Forrester TE. Blood pressure is related to placental volume and birth weight. Hypertension. 2000 Feb;35(2):662-667.
25. Tom KAB Eskes. Abruptio placentae. A 'Classic' dedicated to ElizabethRamsey. Europian Journal of Obstetrics & gynecology & reproductive biology.1997;75:63-70.
26. Udainia A, Jain ML, Morphological study of placenta in pregnancy induced hypertension with its clinical relevance. J Anat Soc India. 2001; 50(1):24-27.
27. Villar J, Carroli G, Wojdyla D. Preeclampsia, gestational hypertension & intrauterine growth restriction related or independent condition? Am J Obstet Gynecol. 2006; 194: 921-931.