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Original Research Article

A Histomorphological Study of Preterm Human Placenta and Term Human Placenta in North Indian Population

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Abstract

The status of the fetus in-vivo is based on the function of placenta which is responsible for the hoemostasis and nutrition of the fetus. The current study is intended to evaluate the morphometric and histological changes in the placenta collected during preterm and term birth. The study arranged 80 placentas from JNMCH, AMU, Aligarh, Department of Gynecology and Obstetrics. 2 groups were made based on the age of the placenta. Those placentas which are of upto 36 weeks were made into assigned to one group while placentas collected during full term birth (37 weeks to 40 weeks) were classified as another group. The samples of placenta were fixed in a 10% solution of saline and formol. The general characteristics specially the morphological properties were evaluated. The weight, decidual region, the diameter of the cord of the term placenta were all determined and were observed that these were significantly higher than those of preterm placenta. Whole thickness tissue blocks were managed from each placenta and each sample was processed with paraffin. Haematoxylin-eosin and Van Gieson stains were utlized for preparation of 1 mm thick slices for observation in light microscopy. It was observed that each sample had 200 villi in total, under high power field microscope. The villi of term placentas almost completely lacked microvilli and syncytial buds. The evaluation of the placenta also revealed that the number of capillaries increased with increasing gestational age. The number of syncytial knots, vasculosyncytial membrane, fibrinoid necrosis, significantly increased in the group formed of term placentas. On the contrary, it was also observed the villi revealing cytotrophoblastic cells and Hofbauer cells significantly reduced.

Keywords: Placenta, Syncytial knot, Microvilli, Hofbauer cells, Syncytial bud

Introduction

The placenta mentions primary influence on the intra-uterine survival of the fetus. The numeral and quality of maternal plasma given to the blood capillary places of the fetus influence the growth of the fetus. [1-3] Numerous studies have demonstrated modification in the brain all through the typical delivery. In order to comprehend the function of the fetus in infant development, one must recognize ductal alterations in construction to gestation. Changes have been observed in the fetal mass and foetoplacental high strength to weight ratio at various gestations. [4] This diversity relies upon the procedures used in processing the tissue samples (Adair & Thelander, 1925). (Adair & Thelander, 1925). In typical early and mature nurslings, there seems to be a clear connection between fetal growth and the mass of the brain (Adair & Thelander) (Adair & Thelander). Relations between low birthweight and fetal area and placental capacity have also been observed (Dow & Torpin, 1939). (Dow & Torpin, 1939). Enders & King (1970) perceived the existence of syncytiotrophoblasts and cytotrophoblasts in the cells and the lack of basal cells of the capillaries in primary human placentas. [5-8] Microvilli on the normal cell were also discovered (Ursula, 1964) (Ursula,1964). The present research is designed to uncover and evaluate numerous criteria linked to physical and histopathological structures and their current components in early and term human fetal tissues. [9]

Material and Method

At the JNMCH, AMU, Aligarh Department of Obstetrics and Gynecology, 80 placentas were collected. Two groups of placentas were created. The first group included 30 preterm placentas, or those with intrauterine lives of up to 36 weeks, whereas the second group included 50 full-term placentas, or those with intrauterine lives of 37 to 40 weeks. Each group's placentas were maintained in a separate container with a 10% formalin-saline solution. The decidual area, thickness, density, and umbilical cord diameter of placentas—as well as other general morphological variables—were observed. Whole thickness tissue blocks from each placenta were kept and prepared for paraffin sectioning. Haematoxylin-eosin and Van Gieson stains were used to colour five micron thick slices. Under a light microscope, many structures including synaptic knots, vasculosyncytial membrane, cytotrophblastic cells and many others have been observed and results have been evaluated.

Observations

Preterm and term placentas had mean placental weights of 352.77 grammes and 513.16 grammes, respectively, while preterm placentas had mean decidual areas of 240.10 square centimetres and 295.768 square centimetres, respectively. Increment in both the parameters were statistically significant (Table-1).

Table 1: Gross features of preterm and term placentas

Gross Features	Pre-Term Placenta	Term Placenta	Significant P<0.01
Placental weight (gm)	352.77 ± 58.43	513.16 ± 38.04	Significant
Decidual area of placenta (cm^2)	240.10 ± 44.503	295.768 ± 47.11	Significant
Thickness of placenta (cm)	1.612 ± .031	2.19 ± 0.38	Significant
Density	0.9974 ± .0334	0.994 ± 0.0069	Insignificant
Umbilical Cord-diameter (mm)	9.0376 ± 1.591	10.70 ± 0.333	Significant

P value < 0.01.

The preterm placental's average thickness was determined to be 1.60 cm while the average thickness in full term placenta was found to be 2.1 cm. The difference between the two, was analyzed and found to be statically significant. In preterm placenta, the density was found to be 0.997 kg m^{-3} while it was 0.994 kg m^{-3} in full term placenta. The variation between this two was found to be statistically insignificant (Refer to Table 1). Again, the increase in cord diameter in preterm placenta increased from 9.03 mm to 10.70 mm when it turns into term placenta.

In both the groups, the mean number of syncytial knots was 11.8 and 25.83 per 200 villi, respectively for preterm and term group. The mean number of cytotrophoblastic cells dropped from 14.16 in the preterm group to 1.61 and the preterm placentas had vasculosyncytial membrane of about 1 while the mean count of full term placentas was 22.5. An average of 1.6 fibrinoid necrosis was observed in the preterm placenta while it was 4 in nuimber in full term placentas. The above variation in number was analyzed statistically. (Table-2).

Table 2: Histological features of preterm and term placenta.

Histological Features (per 200 villi)	Pre-Term Placenta	Term Placenta	Significant P<0.01
Syncytial Knots	11.8 ± 4.16	25.83 ± 2.58	Significant
Cytotrophoblastic cells	14.16 ± 2.62	1.61 ± 1.69	Significant
Vasculosyncytial membranes	1 ± 1.22	22.5 ± 5.14	Significant
Fibrinoid necrosis	1.66 ± 1.5	4 ± 1.4	Significant
Microvilli	10 ± 5.49	0	Significant
Hofbauer cells	11.83 ± 4.13	2 ± 0.63	Significant

P value <0.01

The average number of microvilli was found to be 10 in preterm placenta and in full term placenta, nothing was observed. The average number of Hofbauer cells in term placenta group was found to be 2.0 while it was much higher in preterm group with 11.83. This reduction was statistically significant. Table II presents the details of the findings.

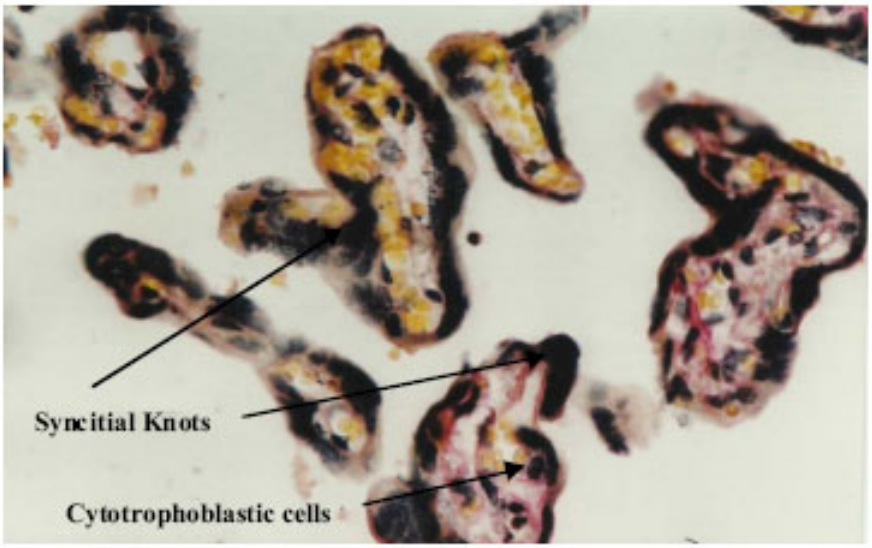

Figure 1: shows syncitial knots and a few cytotrophoblastic cells in the chorionic villi of the term placenta. 400 X V.G. stain

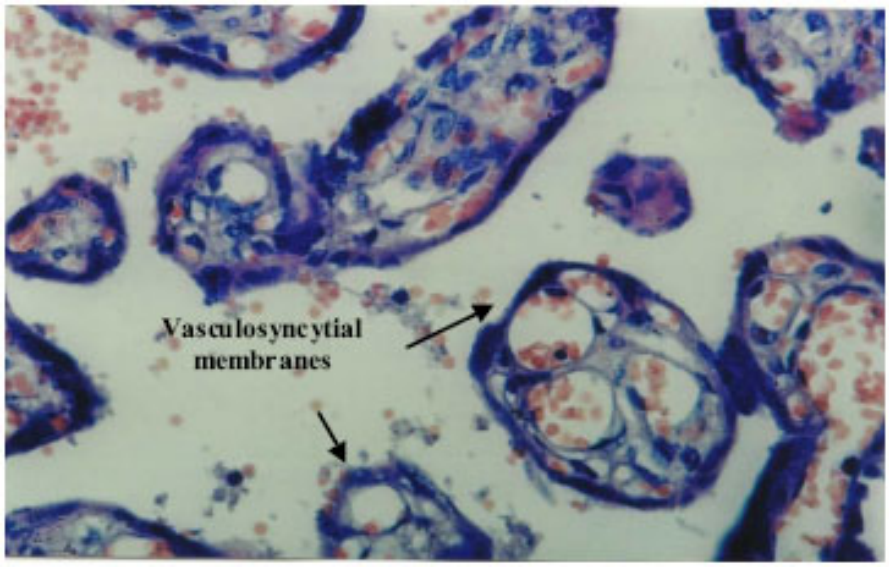

Figure 2: Term placenta's chorionic villi revealing a lot of vasculosyncytial membranes. 400 H&E stains.

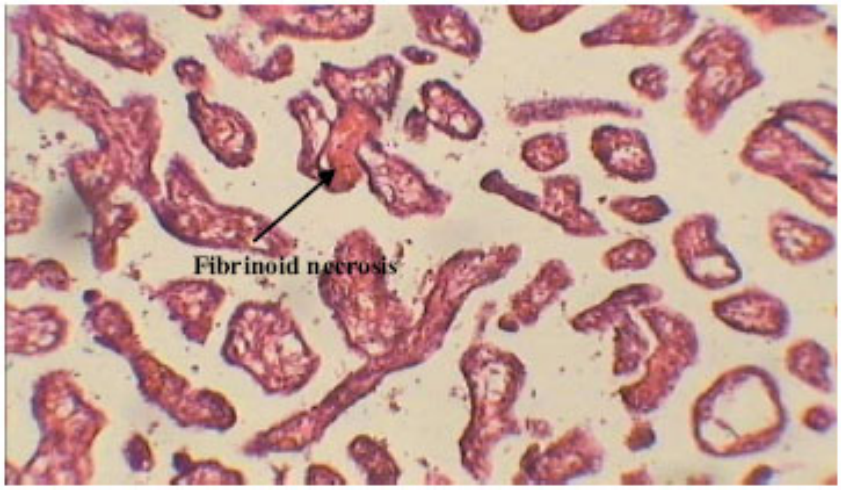

Figure 3: Term placenta's chorionic villi revealing a lot of vasculosyncytial membranes. 400 H&E stains.

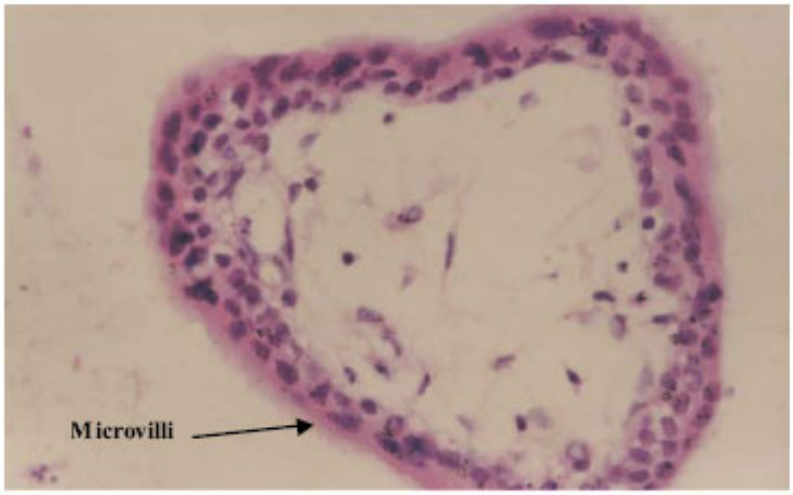

Figure 4: Early placental chorionic villus (6 weeks) with microvilli on the periphery and Hofbauer cells. X400 H&E stain.

Discussion

In this study, the term group had a higher placental mass than the preterm group. This was consistent with Younoszai and Haworth's conclusion (1969). [10] According to Thompson et al. (1969), placental mass varies greatly depending on the method used to prepare the placenta. Younoszai and Haworth regarded the difference to be small despite the fact that their research demonstrated that the median percentage of decidual area grew significantly. According to Grannum and Hobbins (1983), the placental density increased linearly during the first 36 weeks of pregnancy before gradually declining after that. Koslowski (1980) and Tiwari et al. (1997) also noted related findings. [11-15] Premature and term foetuses did not differ in height according to our findings. The average densities of foetal and term foetuses in the current review did not significantly differ from one another, according to Younoszai and Haworth's findings. Except for Lyndon et al. (1987), who measured the circumference of umbilical cords in thin slices of term foetuses and found it to be 1-2 cm, a very high value, this study is the only one to show a substantial increase in umbilical cord diameter in term pregnancies. This might be as a result of the later use of foetal placentas. [16-20]

The syncytial knot data was comparable to that of Mirchandani et al (1979). Syncytial knots, according to Jones & Fox (1977), seem to be a result of concentration since the nuclei that produce them have aging-like physical features. According to earlier studies by Schroder (1930), Hormann (1948), and Clavero, our investigation found that the average number of definitely caused cells was significantly lower (1962). [21] The villous cytotrophoblastic cells, which were so prevalent in the early stages of pregnancy, were reported to have steadily decreased in number as the pregnancy went on and to have disappeared from the mature villi. [22]

According to Fox's (1967) research, there were vasculo-syncytial films on more than 5% of the villi of mature foetuses with reproductive issues. This result confirmed their observations of a significant rise in vasculosyncytial membrane in early placenta. Additionally, he emphasised that a placenta can be considered faulty if its rate is lower than the rate previously mentioned. According to Fox and Agrofojo-Blanco (1974), who observed a selective loss of microvilli on the surface of vasculo-syncytial membranes under an optical microscope, these spatially differentiated syncytiotrophoblast areas are particularly involved in maternal-fetal transfer. The lack of a vasculo-syncytial barrier from the placental terminal villi indicated that the villous system had not developed properly and was also associated with a rise in the incidence of intrauterine foetal hypoxia. The results showed that fibrinoid necrosis significantly increased in full-term placentas. According to a related study, there are somewhat fewer than 3 fibrinoid necrosis cases for every 200 villi in foetal tissues from term, uncomplicated pregnancies (Fox, 1969). This discovery is comparable to ours. [23]

We observed a notable lack of cells in term placental, which is similar to a discovery made by Fox & Agrofojo-Blanco, who thought it would have major functional advantages. According to Hofbauer (1925), Stieve (1941), and Hormann, who thought Hofbauer cells left the placenta during the fourth trimester of pregnancy, there was a considerable decline in the average number of Hofbauer cells in full-term foetal tissues. Our results more closely matched those of Roadway & Marsh (1956) and Geller (1959), who discovered all of these cells in the mature placenta, albeit in smaller numbers.

The placental mass, decidual area, and tissue diameter were thus shown to have

greatly grown. Syncytial knot number, fibrinoid necrosis, and vasculosyncytial membrane all significantly increased in the term sample, but the percentage of villi containing cytotrophoblastic and Hofbauer tissue decreased. According to the needs of the foetus during foetal growth, all of these alterations are expected to stimulate more foetomaternal interactions.

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