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ORIGINAL ARTICLE

Gross Variants of Fetal Membranes in Healthy Placentae among Females in Pakistan

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ABSTRACT

Objective: It is done to find out the gross variants of fetal membranes in healthy placentae among local females to define the variations found among uneventful pregnancies.
Study design: This is a cross-sectional study.
Place and Duration of Study: The study was done at Department of Anatomy, CMH Kharian Medical College. Kharian, from February 2023 to July 2023.
Introduction: Fetal membranes are extraembryonic tissue that include the amnio-chorion. It is considered as an appendage attached to the margin of placental disc. Normally, it is avascular, thin, shiny and translucent structure with great tensile strength and elasticity, though has a short life-span. It has the same genetic composition as the fetus. Placenta membranecae is one having vessels in the smooth chorion and circumvallate placentae in which the membranes are grooved into the disc partially or incompletely are seen as the two types of variants in previous studies.
Materials and Methods: Fetal membranes were obtained by simple random sampling after full term normal deliveries at CMH Kharian. The tissue was preserved and fixated in 12% formalin solution. Gross morphology was done to find out variants with values ≤ 5%. Data analysis was done by using SPSS 20.
Results: Qualitative variants of fetal membranes were considered. The attachment sites as variants were found to be on extension beyond disc margin up to 5% and as partially circumscribed up to 1%. 4% variants of membranes were found to be opaque. No incomplete membranes were found among hundred placentae. Vessels in the membranes were present among 6% of placentae which is more than 5% of the variant.
Conclusion: The variants dispense an altered phenomena which may be taken as a hallmark for future investigations.
Keywords: amnion, chorion, extraembryonic, fetal membranes, placenta.

INTRODUCTION

Fetal membranes include all four components that is the chorion, amnion, umbilical vesicle (yolk sac) and allantois.[1] It is taken as an appendage of placenta whereas the disc is considered to be the specialized part of these membranes.[2] The appendage is continuous from the edge of placental disc. It encloses amniotic fluid along with the fetus forming a sac, the bag of waters in which the growing fetus floats.[3,4] This appendage is extra-embryonic tissue that includes amnion, chorion leave and the contiguous maternal decidua i.e. decidua capsularis and parietalis.[2,5] The chorion leave also known as smooth chorion is composed of three layers: amnion with its epithelium and mesenchyme; the chorion with a layer of mesenchyme and a layer of extra villous trophoblast; and maternal decidua.[4,6] The blood supply becomes restricted to this area and villi degenerate forming an avascular chorion.[2,7]

Normal membranes are very thin, gray in color, wrinkled, shiny, translucent and not malodorous.[8] It is without innervation. It is genetically identical to fetus and has a narrow lifespan. By term, fetal membranes make it necessary as a consequence to be of comparable strength and elasticity being capable of increasing to approximately double its size without tearing.[2]

It is very distinctive for the survival of pregnancy.[2,4,5] The chorion laeve trophoblast seem to have a critical role in preventing the premature onset of labor by expressing high levels of prostaglandin dehydrogenase, which inactivates prostaglandins.[9] Similarly, it has a very important role to play at the time of delivery.[5,10] At term, its rupture is a mapped out physiological happening during first stage of labor.[2] Fetal membranes undergo a telomere dependent senescence at term that indicates ageing i.e. decline in function and mechanical abilities of membranes.[11] Labor is provoked by an increase in corticotropin-releasing hormone and cortisol, that will lead to initiation of prostaglandin synthase activity thus inhibiting prostaglandin dehydrogenase, and as a result an increase in active prostaglandins.[9] Local prostaglandin release increases levels of cortisol by invigorating 11 beta-hydroxysteroid dehydrogenase 1 enzyme activity that converts inactive cortisone to cortisol.[9]

Mossman (1937) stated that the normal mammalian placenta by fusion of the fetal membranes with the uterine mucosa is meant for physiological exchange of nutrient and waste.[2,12,13,14] Placenta is an adaptable organ along with the fetal membranes as it perform various functions in intrauterine life such as protection, nutrition, respiration, excretion and hormone production.[15] It is protective as a barrier to keep the infections out and to keep the amniotic fluid in.[9] It also bestow an immune surface between mother and fetal allograft.[3,5] By the strength of these functions, it tends to play a significant role in fetal programming.[16] It is synonymous to the black box that can translate all the hidden events that took place during intrauterine life.[17]

As already mentioned, the membranes extend from the outer margin of disc which is the peripheral limit of vascular plate.[18] Variants like placenta membranacea occur, in which villus stems and their branches continue to exist over the whole chorion during full lifespan of placenta.[7,10] Circummarginate is the variant that may involve in part or of entire circumference. May extend from 1 to > 10 cm. nonpathological over the disc.[18] Placenta circumvallate is yet another variant in which placental margin is undercut by a deep groove or may exist as doubled-back membrane fold at the point of membrane contact. Hemorrhage often occurs in the former state.[18,19] Both may be associated with intrauterine growth retardation (IUGR).[19]

Quantization of the placental tissue involved in an abnormal process is necessary to distinguish normal variation from significant pathology.[9,20] This study is about to analyze the normal and to identify the variation of gross lesions regarding fetal membranes during the course of pregnancy in the local population. The interest is absolutely academic. Still, an attempt to trawl

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between normal and pathological right away, where pathologists document the lesion as inconsequential.

MATERIALS AND METHODS

This study was conducted at CMH Kharian Medical College. It was a cross-sectional study. The project was approved by *IERB, CKMC/IERB/AC-*, with ethical consideration of inclusion exclusion criteria - an uneventful term single pregnancies of all ages and parities. Sample size is calculated using open epi software at 95% confidence interval and taking frequency of anticipated factors (anatomical variation in placentae) as 95%.[21] The calculated sample size came out to be 60. However, we recruited 100 subjects. Simple random sampling (probability) technique was used to collect specimen via recruiting hundred subjects from Services Hospital, Lahore at Department of Obstetrics and Gynecology. Informed consent along with sociodemographic and antenatal records were obtained. Samples were collected within five minutes of delivery. Each placenta was de-clamped, examined for the membranes and cotyledons. Stored in 2500 ml. 12% formalin in separate containers for fixation. Then, immediately transferred to the Department of Anatomy at University Health Sciences. Grossing was done for the whole placenta and the membranes. Variables specifically for membranes were recorded in tabulated form. This includes qualitative variables of fetal membranes among all subjects i.e. attachment sites for membranes; whether complete or incomplete; appearances and vessels. Relatively unusual morphological finding seen in ≤ 5% of general population was taken as a variant.[22]

Statistical Analysis: Collected data was entered using SPSS 20. Qualitative variables like attachment sites, complete/incomplete membranes, their appearance and presence of vessels were considered. Therefore, data was subjected for percentages, graphs and 95% confidence interval.

RESULTS

Gross morphological features of fetal membranes were included in the study. The results on examination were recorded with particular reference to variables with values ≤ 5% to be taken as anatomical variants as in Table I.

Table I: Qualitative Variables of fetal membranes among all subjects

Variables		Frequency	%	95% CI
Attachment site	At margin of disc	94	94	89.3-98.7
	Extension of disc	5	5	1.3-10.7
	Partially circumscribed	1	1	
Complete		100	100	98-100
Appearance	Transparent	96	96	92.2-99.8
	Opaque	4	4	0.2- 7.8
Vessels	Present	6	6	1.3-10.7
	Absent	94	94	89.3-98.7

Fig. 1: Photograph showing the partially circumscribed placenta as anatomical variant (fetal surface).

Membranes were looked for attachment sites on the disc. It was found to be attached around the margins among ninety-four placental discs i.e. 94%. Also found to be attached to extensions of the disc among five placentae i.e. 5% and partially circumscribed only in one of the placentae i.e. 1% (Fig. 1).

Membranes were complete among all the placentae (100%). The appearance was normally transparent among ninety-six placentae (96%), while it was opaque among four placentae (4%). Vessels were present in 6% of the membranes, while it was absent in 94% of membranes.

Those morphological parameters of the membrane shown to be present in more than 5% of the given sample, therefore do not fall within the given definition of a variant. While, the ones ≤ 5 are taken as variants.

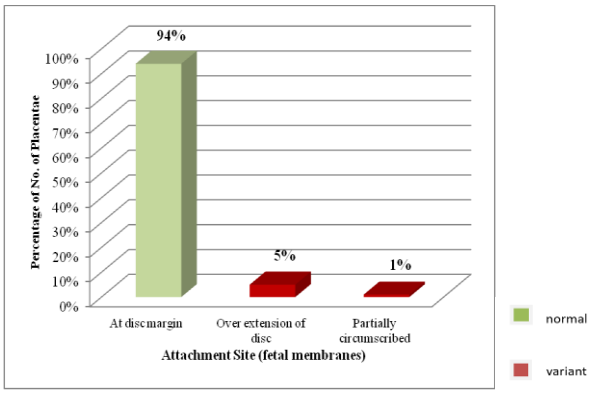

Fig 2: Bar chart showing the percentage of fetal membranes attachment site on the disc as normal and its anatomical variant.

DISCUSSION

Present study revealed that attachment site for the fetal membranes was at the margin of the disc in 94% of placentae, while in 5% placental discs the membranes reached the extended margin of the disc and only 1% placenta seem to be partially circumscribed i.e. the membranes were partially inserted into disc close to the margin. The last two possibilities are taken as anatomical variants (Fig.2). Our study is consistent with Parolini et al., who expressed that the fetal membranes are normally attached to the margins of the chorionic disc.[3] Also, Huppertz explained that the chorionic and basal plates merge at the placental margin to form the smooth chorion.[6] Similarly, it is also consistent with that of Kaplan, who described that fetal membranes are normally inserted at the outer margin of the villous tissue which is the peripheral limit of the vascular plate, but if the villous tissue extends beyond the vascular plate, then there is extrachorial attachment of these membranes which is so true among 5% of the anatomical variant in this study.[18] While, the study is inconsistent with that described by Hargiti et al., who associated the extended attachment with intrauterine growth retardation.[19] Kraus et al. described the two variants as disorders of placental development, the former as poorly understood where the chorion is completely vascularized, while the latter is a common entity ranging between 1 to 7 % of placentae. This probably is due to venous hemorrhage at the margin of disc which is responsible for folding of the membranes embedding into the disc inner to its margin.[9]

Fetal membranes were found to be complete in all placentae i.e. 100%. Therefore, no variation was seen in this respect. Kraus et al., stated that incomplete membranes are associated with extramembraneous pregnancy due to intramembranous rupture leading to severe complications like pulmonary hypoplasia or death in first few hours after birth.[9] This may be associated with amniotic bands.

Amnion covering the fetal surface of the placental disc in 96% placentae appeared to be transparent, while in 4% placentae it appeared to be relatively opaque which was taken as anatomical

variant. Consistent with our results, normally the fetal surface of placenta was shown to be shiny, gray and translucent as is stated by Yetter, so that color of underlying maroon villous tissue be visible.[8] Kaplan, also described that the color and translucency of the placental membranes covering the fetal surface may be variable, depending on various factors like edema, pigmentation, cellular content and amount of attached decidua.[18]

In this study, vessels were absent among 94% and present only in 6% of the fetal membranes. This morphological parameter exceeded 5% or less, therefore it is not to be taken as a variant. However, in placenta membranacae taken as variant, described by Healy et al. and Moor et al. there is persistence of villous stems and its branches over the chorion beyond margin of disc.[7,10]

CONCLUSION

This study was taken up to identify anatomical variations among gross features of fetal membranes which exists among ≤ 5% of the total specimen examined. Grossly, the fetal membranes show a few qualitative variables that exist in term placentae among women in Pakistan. The data confirmed that anatomical variants do exist for fetal membranes by the difference in the attachment site, either on the extension site or as grooved with in the placental disc or by their appearance as opacity in the normal term pregnancies in local female population. These variants may exist in seclusion, but they share an altered phenomenon during intrauterine life which is considered as non-pathological. This may be taken as a marker for future investigation for differentiation from the clinically pathological findings.

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