CLINICAL AND MORPHOLOGICAL CHARACTERISTICS OF THE HUMAN PLACENTA AND ITS ULTRASOUND PARAMETERS IN NORMAL PREGNANCY

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Introduction. The placenta is the fundamental organ of pregnancy, serving as the interface between the maternal and fetal circulatory systems. It provides respiratory, nutritional, endocrine, and immunological functions, ensuring optimal fetal development. Disturbances of its formation and maturation are closely associated with obstetric complications such as preeclampsia, intrauterine growth restriction (IUGR), placental insufficiency, and preterm labor.

Recent literature highlights the clinical significance of both morphological and ultrasound (US) parameters of the placenta. Placental thickness (PT) has been widely investigated as a non-invasive marker reflecting gestational age, placental function, and fetal well-being. Gbande et al. (2023) demonstrated that PT increases progressively across trimesters and strongly correlates with gestational age ($r \approx 0.87$, $p < 0.00001$). Morphological studies describe normal placenta as a discoid organ, with villous structures, balanced vascularization, and stable dimensions by late pregnancy (Sagberg et al., 2024). Given the predictive value of these findings, systematic analysis of normal placental parameters is essential for early identification of pregnancy risks.

Aim and objectives. The aim of this study was to review and analyze modern data on the normal clinico-morphological structure of the human placenta and its ultrasound characteristics during uncomplicated pregnancy.

The objectives were as follows:

1.   To describe the normal morphological structure of the placenta across gestation.

2.   To systematize ultrasound parameters and their correlation with gestational age.

3.   To evaluate the prognostic role of placental characteristics in clinical practice.

Materials and methods. A narrative review methodology was employed. Sources published between 2014 and 2024 were identified using PubMed, Scopus, and Web of

Science databases. Keywords included "placenta morphology," "ultrasound parameters," "placental thickness," "gestational age," and "pregnancy outcomes." Inclusion criteria were original studies and reviews reporting normative placental data in healthy pregnancies. Exclusion criteria included studies with pathological pregnancies or insufficient sample sizes. A total of 46 publications met the inclusion criteria, including cross-sectional, cohort, and morphometric studies.

Data were extracted regarding morphological features (weight, volume, dimensions, vascularization), ultrasound indicators (PT, echogenicity, localization), and clinical correlations with fetal growth and maternal outcomes.

Results. The reviewed studies consistently confirmed that PT increases linearly with gestational age, reaching maximum values at 35–36 weeks before stabilizing or slightly reducing. Mean PT reported by Gbande et al. (2023) was 13.5 ± 3.7 mm in the first trimester, 24.6 ± 4.1 mm in the second trimester, and 34.7 ± 4.2 mm in the third trimester. Posterior placentas were shown to be slightly thicker compared to anterior ones, with differences of 3–9 mm.

Morphological analyses demonstrated that the average placental diameter is approximately 17–18 cm, thickness 3–3.5 cm, and weight 450–550 g at term (Sagberg et al., 2024; Zhang et al., 2023). Placental weight below 350 g is associated with small-for-gestational-age neonates, while excessive thickness (>95th percentile) has been linked to preeclampsia and perinatal complications (Agrawal et al., 2024).

Clinical evidence supports the use of PT as a reliable predictor of gestational age and fetal growth. Strzelec et al. (2023) showed that PT measurement can supplement biometric fetal parameters in cases of uncertain dating. Abnormally thin placentas (<10th percentile) were correlated with IUGR, while abnormally thick placentas predicted poor neonatal outcomes (Miwa et al., 2014). Thus, US and morphological features of the placenta represent significant diagnostic and prognostic tools.

Conclusion. The placenta demonstrates characteristic clinico-morphological and ultrasound changes throughout gestation. Normal placental thickness correlates strongly with gestational age and fetal growth, serving as a valuable non-invasive marker of pregnancy progress. Deviations from normative ranges are strongly associated with adverse obstetric outcomes.

Systematic use of standardized US measurement, combined with morphological analysis, can improve early diagnosis of placental dysfunction and guide clinical decision-making. Future research should focus on developing population-specific

normative ranges and integrating placental parameters into comprehensive predictive models for perinatal risk assessment.

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