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ESTIMATION OF GESTATION AGE BY FETAL KIDNEY LENGTH ON ULTRASONOGRAPHY

Radio-Diagnosis

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ABSTRACT

Introduction: Biometric parameters, such as biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL), are commonly used to estimate fetal gestational age either alone or by taking their average. The study aims to determine whether fetal renal length can be used as a reliable measure of gestational age, while also comparing its accuracy with other commonly used biometric measurements. This will help establish the utility of fetal renal length in clinical settings for estimating gestational age. **Material and Methods:** The present study was a prospective cross-sectional study conducted at a single institution. It included a group of healthy pregnant women whose last menstrual period (LMP) and dating scan were known and whose gestational age ranged from 26 to 40 weeks. A total of 100 consecutive pregnant women were enrolled in the study to ensure a representative sample. The aim was to assess the accuracy of fetal renal length in estimating gestational age and to compare it with other commonly used biometric parameters. **Results:** The study showed a strong correlation between fetal renal length and gestational age estimated using standard fetal biometry measurements such as BPD, HC, FL, and AC. This indicates that fetal renal length can be used as an accurate measure of gestational age, comparable to other commonly used biometric parameters. **Conclusion:** The findings of this study suggest that fetal renal length can be used as an independent parameter in the estimation of fetal gestational age. The strong correlation between fetal renal length and other standard biometric parameters indicates that it can be a reliable measure for gestational age estimation. Therefore, fetal renal length can be used as an additional tool in clinical practice for accurate determination of gestational age in pregnant women.

KEYWORDS

Sonography, kidney size, gestational age, and fetal renal length.

INTRODUCTION:

The kidneys are vital abdominal organs, not only after birth but also during fetal development. As the developing fetus is suspended within the gestational sac in amniotic fluid, fetal kidneys play a crucial role as a source of this fluid. Therefore, evaluating kidney development during fetal growth is crucial. Estimating kidney size is one of the parameters used to assess fetal kidney development. Like any other organ, fetal kidneys grow progressively during fetal life. Estimating fetal gestational age using conventional parameters is a widely accepted practice. However, it has been observed that fetal kidney length is also correlated with gestational age and can be used to estimate fetal gestational age. Conversely, for a given gestational age, the normal size of the kidney can be tabulated and used as a guide to determine the appropriateness of the kidney size for the expected gestational age.

MATERIALS AND METHODS:

This study was a single institutional prospective cross-sectional study conducted between January 2021 and February 2022. Institutional review board approval was obtained before the study was conducted. The study included 100 consecutive normal pregnancies with known LMP and correlating dating scan, and oral informed consent was obtained from all participants. Pregnancies with known complications such as IUGR, poly or oligohydramnios, maternal diabetes mellitus, unreliable LMP, or those without a first trimester dating scan, including multiple pregnancies, were excluded from the study. Fetuses with a prominent or dilated renal pelvis greater than 5 mm were also arbitrarily excluded. Cases in which the upper pole and adrenal gland were not clearly visible during renal length measurement were not included in the study.

Fetal kidneys were visualized in the para-sagittal plane, and both the upper and lower poles were identified. The longest pole-to-pole length was measured to determine fetal renal length (as shown in Figure 1). Multiple studies have demonstrated that there is no significant difference in the right and left renal length, and fetal sex does not affect the measured fetal kidney size. To reduce operator error in measuring kidney size, both the right and left kidney lengths were measured, and the average of the values was recorded.

Statistical Analysis:

The data collected was tabulated and analyzed by calculating the mean, standard deviation, and standard error. The results were then converted into a scatter plot graph using MS Excel software.

RESULT:

In this study, 100 cases were included with the majority of cases between 33 to 38 weeks of gestation, followed by 31, 28, and 26 weeks. There were few cases in 39 and 40 weeks of gestation. All fetuses had identifiable kidneys and were measured. The mean fetal renal length increased from 26.02±0.25mm at 26 weeks to 42.5±0.7mm at 40 weeks of gestation. Linear correlation was observed between kidney length and gestational age (Graph 1). The standard deviation of measured fetal kidney length increased with gestational age, but the measured renal length correlated well with the standard biometry. Table 1 presents the data on the distribution of cases in different gestational weeks.

DISCUSSION:

Determining gestational age accurately is crucial in antenatal care, and ultrasound has become a vital tool for this purpose. The commonly used biometric parameters for estimating gestational age include biparietal diameter, head circumference, abdominal circumference, and femoral length. However, these parameters become less reliable as pregnancy progresses, and the margin of error can be as much as 2-3 weeks in the third trimester. Hence, alternative parameters like fetal kidney length, fetal foot length, and transverse cerebellar diameter have been proposed to increase the accuracy of gestational age estimation.

In this study, the accuracy of fetal renal length in predicting gestational age was evaluated from 26 to 40 weeks of gestation. Fetal kidneys can be visualized as early as 16 weeks of gestation, and accurate measurements of fetal renal length can be obtained by identifying the renal poles in the para sagittal plane. In this study, 100 consecutive normal pregnancies with known last menstrual period and correlating dating scan were included, and the mean fetal renal length was found to increase linearly with gestational age.

The results of this study suggest that fetal renal length can be a useful parameter for assigning gestational age in the third trimester and as a problem-solving tool when standard biometric values are not correlating or cannot be measured due to maternal or fetal factors. However, further studies are required to evaluate the accuracy of fetal renal length in estimating gestational age in a larger population and to determine the factors that may affect fetal renal growth.

CONCLUSION :

In conclusion, the measurement of fetal renal length is a valuable parameter for the estimation of fetal gestational age, especially in the third trimester. While traditional biometric parameters such as BPD, HC, AC, and FL are widely accepted, they have limited accuracy in the later stages of gestation. Fetal renal length is easily measurable and correlates well with gestational age. Additionally, when standard biometric values cannot be measured due to maternal or fetal factors, fetal renal length can serve as a useful problem-solving tool. It is important to note that towards term, fetal renal length may be higher than the calculated gestational age based on the standard biometry.

Table 1:Distribution of cases based on gestational age and renal length

Gestation age in weeks	No. of cases	Mean renal length (mm)	SD
26	7	26.03	0.26
27	4	27.00	0.08
28	9	28.02	0.17
29	5	29.00	0.16
30	4	30.13	0.30
31	7	31.13	0.26
32	4	32.55	0.41
33	11	33.57	0.47
34	7	34.57	0.34
35	10	35.89	0.57
36	8	36.63	0.50
37	8	37.66	0.68
38	11	38.82	0.68
39	3	39.50	0.50
40	2	42.50	0.71

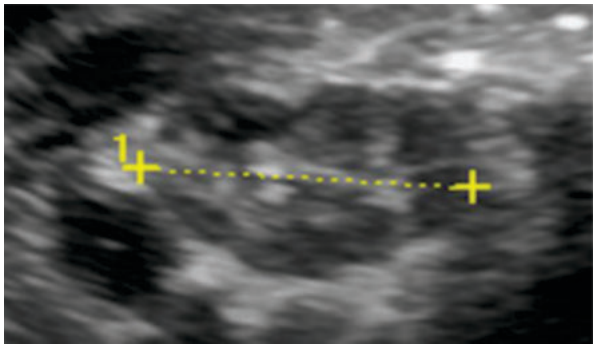
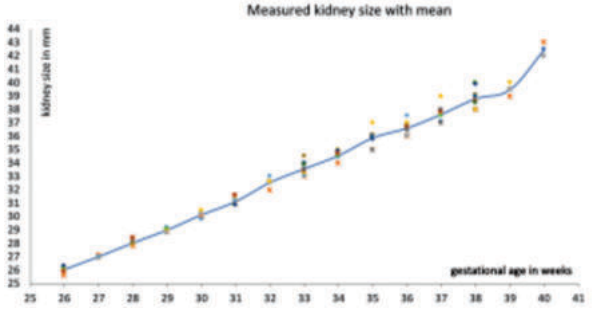


Figure 1: fetal kidney length



Graph 1: Gestational age with fetal kidney length

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