Correlation between Fetal Kidney Length and Fetal Biometry for Gestational Age Determination in Third Trimester in Low-risk Pregnancy

1Divyasree B Reddy, 2Kanakapura B Suma

ABSTRACT

Estimation of gestational age plays an important role in quality maternity care. Ultrasound provides an accurate method of determining fetal age in utero. A prospective study was done in 150 pregnant women with low-risk pregnancy after 28 weeks of gestation who were sure of their last menstrual period or had underwent dating scan. The aim of this study was to determine the accuracy and application of fetal kidney length (FKL) measurement in determining the gestational age of the fetus in the third trimester and compare its accuracy with that of other fetal biometric indices [biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL)]. The FKL measurements showed that there is a linear relationship between FKL and gestational age. The mean kidney length in mm approximates the gestational age in third trimester as predicted by BPD, HC, AC, and FL. The FKL dates the pregnancy more accurately (correlation coefficient 0.98) when compared with BPD, HC, AC, and FL. The results obtained concluded that FKL can be used as a reliable parameter for determination of gestational age.

Keywords: Fetal kidney length, Gestational age, Ultrasonography.

How to cite this article: Reddy DB, Suma KB. Correlation between Fetal Kidney Length and Fetal Biometry for Gestational Age Determination in Third Trimester in Low-risk Pregnancy. J South Asian Feder Obst Gynae 2017;9(4):404-406.

INTRODUCTION

Ultrasound plays a very crucial role in the diagnosis of a number of medical conditions. Ultrasound has revolutionized the diagnosis and the management in the field of obstetrics, where it has been a major contributor in management. Its noninvasive and nonionizing nature and cost-effectiveness led to its wider acceptability. The exemplary safety record of diagnostic ultrasound is probably an important reason that it has become so widely used. Accurate gestational age assessment is pivotal to quality maternity care. Failure can result in iatrogenic prematurity or postmaturity, both being associated with increased perinatal morbidity and mortality. Obstetric sonography plays an important role in the accurate determination of intrauterine gestational age.

Since the introduction of diagnostic ultrasound, more reliable approaches to the dating of pregnancies have been developed. These include gestational sac diameter and volume and crown rump length measurement in the first trimester. Crown rump length measurement has been described to predict gestational age accurately to within ± 4.7 days. In the second trimester, most commonly used biometric indices for dating pregnancies are fetal biparietal diameter and femur length. However, as gestational age progress, they become increasingly unreliable because of the biological variability of size in relation to age. Accurate dating of pregnancies in the late second trimester or in the third trimester, therefore, remains a problem, especially in women who consult late for maternity care and are uncertain of the date of their last menstrual period (LMP). The present study was undertaken to validate the FKL measurement as an additional morphological measurement of fetal growth with less variability.

MATERIALS AND METHODS

This study was conducted in JSS Medical College, JSS University, Mysuru, India, in the Department of Obstetrics and Gynaecology during the period of October 2013 to September 2015. A total of 150 healthy women in third trimester, who are sure of their LMP or underwent dating scan (in 1st trimester), with complete visualization of at least one fetal kidney, with no associated risk factors were included in the study. Unclear renal or adrenal borders, abnormal renal morphology, and renal pelvic dilatation more than 4 mm were grouped for exclusion. Fetuses with anomalies and intrauterine growth restriction were also excluded.
Patients with multiple gestation, diabetes/hypertension complicating pregnancy, or oligo/polysyndrannios were also excluded from the study. Women were evaluated following which third-trimester ultrasonography is done using Siemens Sonoline or Philips HD 7 Xe for mean FKL along with other biometric indices like BPD, HC, AC, and FL. Gestational age was assessed clinically and by ultrasound, and the values are then compared.

**STATISTICAL ANALYSIS**

Statistical analysis was carried out using commercial software Statistical Package for the Social Sciences version 16. Standard deviation was taken as measure of variation and the frequencies of the data were expressed as mean. The relationship between FKL and other fetal parameters have been explored using regression analysis. Level of significance expressed as p-value <0.05 was taken as significant.

**RESULTS**

The results were analyzed with respect to age of the patient, parity, FKL and compared with other biometric indices. In this study, 74% of women were between 20 and 29 years of age, 14% belonged to the teenage group, and 12% were above 30 years of age. Parity distribution was almost equal. This study shows that kidney length increases linearly with gestational age as shown in Graphs 1 and 2. The mean FKL in mm approximates the gestational age in weeks in third trimester as predicted by BPD, HC, AC, and FL. Gestational age was assessed clinically and by ultrasound, and the values are then compared.

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In the present study, FKL and all other biometric indices correlated well with the clinical gestational age. All the correlations are clinically significant and the best correlation was between clinical gestational age and FKL with correlation coefficient of 0.98 as shown in Table 2.

**DISCUSSION**

In this prospective study of 150 healthy women with low-risk pregnancy, a correlation was obtained between gestational age and FKL. A linear relationship was found between fetal kidney growth and the gestational age in third trimester. The relationship between FKL and gestational age is statistically significant. In present study, FKL...
gestational age correlated well with clinical gestational age with correlation coefficient of 0.981, which is in correlation with the study done by Cohen et al. The correlation coefficient of this study when compared with the study done by Konje et al and Kaul et al showed that the most accurate was FKL with a correlation coefficient of 0.91 by Konje et al, 0.958 by Kaul et al, and 0.981 by the present study. Rule of thumb is that “fetal kidney length in mm approximates GA in weeks” as shown by the study done by Yusuf et al. In our study, we also found the same and the mean length of FKL linearly increased with gestational age and a strong correlation exists between FKL gestational age and gestational age determined by BPD, HC, AC, and FL. This study demonstrated that by measuring kidney length, pregnancies could be dated accurately with $r = 0.981$ in those booking late or in those who had forgotten their LMP and presented late for booking, which is in correlation with the study by Kansaria and Parulekar. Kidney length predicted the gestational age with better precision than other biometric indices. This provides an obvious advantage where BPD or HC cannot be accurately measured because the fetal head is too low or the correct plane for measurement cannot be obtained. In these cases, kidney length can be used on its own to estimate gestational age.

**CONCLUSION**

From this study, we would like to conclude that FKL measurement is an accurate parameter for determining the gestational age in third trimester and could be easily incorporated into the models for estimating gestational age. This study could pave the basis for further research in establishing FKL as the single most reliable parameter in gestational age assessment in the third trimester.

**REFERENCES**