



ORIGINAL RESEARCH PAPER

Gynaecology

FETAL KIDNEY LENGTH:A NEW PARAMETER FOR DETERMINATION OF GESTATIONAL AGE IN 3RD TRIMESTER

KEY WORDS: BPD, Femur length, Fetal Kidney Length, & Gestational Age.

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ABSTRACT

Background: Fetal kidney length in estimation of GA: Recent studies have shown that the fetal kidney length can be used to make an accurate measure of fetal gestational age, particularly in third trimester of pregnancy. The importance of accurately knowing the gestational age of pregnancy is well understood in the pretext of Antenatal Care and fetal surveillance. Ultrasound based fetal biometry has a proven to be a simple, accurate, noninvasive and a more objective method of gestational age estimation.

Objectives: To study the accuracy of fetal kidney length as a marker of gestational age in third trimester. And to prove Fetal Kidney Length (FKL) is the most accurate single parameter for estimating GA than other biometric indices Biparietal Diameter (BPD), Femur Length (FL) in late 2nd and 3rd trimester

Materials and Methods: STUDY DESIGN: Prospective Observational study-Analytical study

SAMPLE SIZE-300: Patients examined in three sittings at an interval of 4 weeks

Patients attending Antenatal OPD KMCH above 30 weeks of gestation whose gestational ages were confirmed by early USG. (<20 weeks).

Length of the nearer kidney was measured in centimeters, 4 weekly in the longitudinal axis along with other biometric indices like BPD, FL and FKL.

Results: In our study, the correlation of gestational age with BPD of 900 observations revealed a correlation coefficient (r) = 0.7949 and regression coefficient (R^2) = 0.6319. The correlation of gestational age with FL of 900 observations revealed, a correlation coefficient (r) = 0.9206 and regression coefficient (R^2) = 0.8475. The correlation of gestational age with FKL of 900 observations revealed a correlation coefficient (r) = 0.9591 and regression coefficient (R^2) = 0.9199.

Conclusion: In our study, FKL was the most accurate single parameter for the estimation of GA closely followed by FL. FKL is easy to identify and measure. Fetal kidney length is an excellent marker of gestational age in patients registering for antenatal checkup in late second or third trimester and could be easily incorporated into the models for estimating GA. It has a statistically significant p value. And its correlation coefficient is higher than the standard FL.

Introduction:

In the past years, dating of pregnancy was done with the menstrual age. This period is actually about 14 days prior to ovulation and fertilization of ovum and 21 days prior to blastocyst implantation. But still this was widely used because most patients know their last menstrual period. Still there are certain issues to be addressed because of two factors.

1. In majority of cases the first day of LMP cannot be remembered correctly by many patients.
2. Estimating the date by LMP is done on assumption that the fertilization occurs in the middle of cycle, whereas there is a chance that it could have taken place earlier or later.

The original Nageles rule is applicable only for patients with regular 28 days cycle. In case of 35 or above days, corrected EDD is to be estimated. This is often not done. In cases of cycles of more than 45 days, corrected EDD cannot be estimated. The time in days or weeks from period of ovulation is considered to be the ovulation age. Post conception age also is different, because the exact length of follicular phase is not known. Hence the time of actual conception is not known.

Accurate dating of pregnancy is important for a many reasons, each of them constituting milestones which are more important than the prediction of the actual EDD. In case of antenatal screening, triple and quadruple tests are strongly related to gestational age. It may lead onto errors, if the gestational age assigned by LMP is wrong. We may miss a pregnancy that is at risk with false negatives, or may do invasive unwanted tests such as amniocentesis or CVS with false positives cases. Apart from that, it also helps in estimating fetal viability. Also, the chances of a baby's

survival in a high risk pregnancy is heavily dependent on the gestational age.

Inappropriate dating leads to inappropriate management. This has lead to unnecessary induction of labour in pregnancies that go beyond 40 or 41 weeks, which may lead onto failure of induction and unwanted caesarean sections. And in elective repeat caesarean sections, due to dating errors, iatrogenic prematurity occurs. In recent studies they have found that this contributes 25% of the preterm babies.

The advanced imaging radiological techniques and protocols have improved our study of growth of fetus and maturation and help us in timing our delivery.

AIMS AND OBJECTIVES OF MY STUDY

To study the accuracy of fetal kidney length as a marker of gestational age in third trimester. And to prove Fetal Kidney Length (FKL) is the most accurate single parameter for estimating GA than other biometric indices Biparietal Diameter (BPD), Femur Length (FL) in late 2nd and 3rd trimester

MATERIALS AND METHODS

STUDY DESIGN: Prospective Observational study-Analytical study

PERIOD OF STUDY: MAY 2015 to MARCH 2016(10 MONTHS)

PLACE OF STUDY: Antenatal OPD, Kilpauk Medical college Hospital

SAMPLE SIZE-300 Patients examined in three sittings at an interval of 4 weeks

INCLUSION CRITERIA

Patients attending Antenatal OPD KMCH above 30 weeks of

gestation whose gestational ages were confirmed by early USG. (<20 weeks).

Length of the nearer kidney was measured in centimeters, 4 weekly in the longitudinal axis along with other biometric indices like BPD, FL and FKL.

EXCLUSION CRITERIA

- Chromosomal or congenital anomalies of the fetus,
- Multiple pregnancy
- Offspring of diabetic mothers
- Fetuses with renal pelvic dilatation of 4 mm or greater
- Amniotic fluid abnormalities
- Abnormal renal morphology
- In whom adrenal and renal borders could not be visualized
- Small-for-gestational age (SGA) birth (birth weight < 2. 3rd)
- Large-for-gestational age at or >95th percentile for gestational age
- MATERNAL DISEASES (diabetes mellitus or hypertension).

Patients who attended Antenatal OPD were selected in random manner excluding the above factors. Patients were informed about the study and included in the study after getting proper informed consent. Ultrasound machine at antenatal OPD, KMCH was used for the study. All biometric indices were measured in the first sitting. Patients were instructed to come at 4 weeks interval. In each sitting, all three measurements along with regular antenatal screening were done.

Results:

Table:1 MEAN VALUES AND RANGE OF BPD,FL,FKL FOR THE GESTATIONAL AGE PERIODS BPD(BIPARIETAL DIAMETER): MEAN VALUES

95% Confidence Interval for Mean						
BPD (cm)	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound
GA 30-33 wks	300	7. 4381	. 24165	. 01395	7. 4106	7. 4655
GA 34-36 wks	300	8. 9703	. 44047	. 02543	8. 9203	9. 0204
GA 37-38 wks	300	9. 2234	. 44831	. 02588	8. 9724	9. 5743
Total	900	8. 4773	. 83176	. 02773	8. 4228	8. 5317

P=0.000<0.001 STATISTICALLY SIGNIFICANT.

Table : 2 FL (FEMUR LENGTH): MEAN VALUES

95% Confidence Interval for Mean						
FL (cm)	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound
GA 34-36 wks	300	6. 6822	. 20019	. 01156	6. 6594	6. 8949
GA 37-38 wks	300	7. 4875	. 24801	. 01432	7. 3594	7. 5157
Total	900	6. 6364	. 74450	. 02482	6. 5877	6. 6851

P=0.000<0.001 STATISTICALLY SIGNIFICANT.

Table: 3 FKL(FETAL KIDNEY LENGTH) MEAN VALUES

95% Confidence Interval for Mean						
FKL	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound
GA 34-36 wks	300	3. 4080	. 06149	. 00355	3. 4010	3. 4150
GA 37-38 wks	300	3. 8171	. 07340	. 00424	3. 7987	3. 8254
Total	900	3. 4257	. 31876	. 01063	3. 4048	3. 4465

Table:4 MEDIAN VALUES Median values

Gestational age	BPD	FL	FKL
30-33 weeks	7. 440	5. 740	3. 050

34-36 weeks	9. 100	6. 690	3. 408
37-38 weeks	9. 290	7. 540	3. 800

The median values of all 3 parameters in each gestational group was observed.

The above table gives the median value.

Table:5 COMPARATIVE ANALYSIS

PARAMETER	CORRELATION	COEFFICIENT OF	P-VALUE
	COEFFICIENT(r)	DETRMINATION((R2)	
BPD	0. 7949	0. 6319	<0. 0001
FL	0. 9206	0. 8475	<0. 0001
FKL	0. 9591	0. 9199	<0. 0001
MULTIPLE	0. 9665	0. 9341	<0. 0001
REGRESSION			

Finally, we inferred that on linear regression model, FKL showed excellent correlation coefficient and coefficient of determination, with gestational age that is close to and even higher than FL.

DISCUSSION

The Sample size for this study is 300 and the values were observed in 3 different periods of gestation. Age distribution of the study reveals that maximum (38. 7%) number of enrollment were in the 26-30 years group and the second maximum(30. 3%) of enrollment were in the 21-25 years group.

Regarding parity, primigravida and second gravida attribute to 89. 7% of total enrollment. In this study, we observed 3 parameters (BPD,FL,FKL) in 3 different periods of gestation in the same patient. So the total number of observations were 900.

No difficulty was experienced in our study in measuring the fetal kidney length. A little manipulation of the transducer position and angle of insonation relative to the kidney plane allowed easy identification of both kidneys which is in agreement with Konje et al.

In our study, the correlation of gestational age with BPD of 900 observations revealed a correlation coefficient (r) = 0. 7949 and regression coefficient (R²) = 0. 6319. The correlation of gestational age with FL of 900 observations revealed, a correlation coefficient (r) = 0. 9206 and regression coefficient (R²) = 0. 8475. The correlation of gestational age with FKL of 900 observations revealed a correlation coefficient (r) = 0. 9591 and regression coefficient (R²)=0. 9199.

Among all the 3 parameters, FKL had a good correlation with gestational age, with a correlation coefficient (r) of 0. 9591. This is almost coinciding with the study done by Indu Kaul, r=0. 958.

The multiple regression of all three diagnostic parameters and gestational age reveals that regression coefficients (R²) is slightly higher than the individual R² values (R²=0. 934). This clearly correlates with the study "Role of kidney length in estimation of gestational age" by Indu Kaul (R²=93. 5).

	Correlation coefficient (r)	Regression coefficients (R ²)	P-value
MULTIPLE	0. 9665	0. 9341	<0. 0001
REGRESSION			

CONCLUSION

Knowledge of gestational age is of great importance in obstetric practice. Optimal assessment of GA requires good judgment by the obstetrician which result in good perinatal outcome. Since history (LMP and regularity of menstrual cycles) and clinical date (uterine size) are often not reliable, the most precise parameter for pregnancy dating should be determined by the obstetrician.

The biometric indices(BPD & FL) used in second trimester continue to be used in third trimester despite the fact that error for these measurements increases with advancing gestation and therefore were likely to be more inaccurate as the GA progresses.

In our study, FKL was the most accurate single parameter for the estimation of GA closely followed by FL. FKL is easy to identify and measure. Fetal kidney length is an excellent marker of gestational age in patients registering for antenatal checkup in late second or third trimester and could be easily incorporated into the models for estimating GA. It has a statistically significant p value. And its correlation coefficient is higher than the standard FL.

In this study, it is proved that we can estimate the gestational age with fetal kidney length with less standard error. FKL can be a valuable tool in cases where other established biometric indices are show gross discrepancies with each other or with GA.

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