

Fetal age determination from length of femur and humerus by Ultrasonography

RK Gorea*, Parveen Mohan**, Anil Garg***, Nayana Pathak****

*Professor and Head, Forensic Medicine, GSMC, Distt. Patiala, **Professor and Head, Obstetrics and Gynecology, GSMC, Distt. Patiala, ***Assistant Professor, Forensic Medicine, GSMC, Distt. Patiala, ****Assistant Professor, Obstetrics and Gynecology, GSMC, Distt. Patiala

Abstract

Age determination of fetus is a major problem in postmortem cases. The age determination is done by various established methods but sometimes the body of fetus is decomposed or mutilated and then we do not have the routine features which can help in determination of the age. The data is available for determination of age from femur and Biparietal diameter of the skull but every time we see a dead fetus particularly when it is decomposed and mutilated femur or intact skull may not be available. Length of kidney is also used to find the gestational age. To overcome such situation data of length of humerus was collected along with other established parameters of ultrasonography. This study was done so that collected data may be utilized to ascertain the age of the fetus in such cases particularly in the Indian scenario.

Key words

Age determination, Femur length, humerus length, Ultrasonography

Introduction

Measurement of various fetal body parts is known as fetal biometry. There are many uses of Ultrasonography during pregnancy. One of the uses of Ultrasonography is measurement of various fetal parts. If the exact date of LMP is known then it can be useful in correlating the length of the femur, kidney and Biparietal diameter with gestational age.

When the autopsy is done on body of fetuses, in some cases all parameters are not available particularly when body is decomposed or mutilated. Sometimes only bones are available. Then there is no other option except to find out the age from bones. Measurement of length of bone at autopsy is very easy, less time consuming and a cheaper way of finding out the age of the fetus. In many cases we may not have all the bones. If femur is present then we have data for the same but in case the femur is not available then we may have to find out the age from other bones e.g. humerus. By doing this study we will be able to provide data to solve such cases but still simultaneously having the data of length of femur to avoid venturing into a very new parameter.

Review of literature

Measurements of bi-parietal diameter help in determination of age of fetus. Other useful measurements in the fetus are femur length, abdominal circumference and head circumference¹ and measurement of length of kidney². If more than one parameter is taken in determining the age of fetus it is

considered better as reliance is not kept on one parameter¹.

Bi-parietal diameter measurement is in less common use after 20 weeks of gestation¹ (Hohler, 1984). Measurement of kidney length is useful between 24th to 38th weeks² (Konje et al, 2002). Prior to 36 weeks femur length and BPD have more value but after 36 weeks head circumference and femur length has more value¹. In the third trimester length of femur is a better parameter as compared to BPD for determination of age of fetus³.

Measurement of femur length is considered a sensitive and precise variable for determination of age of fetus and the error is + - 5days in the gestational period of 25-35 weeks⁴ and is considered better method as compared to BPD⁵. The measurement increased from a mean femur length of 15.9 mm at 14 weeks' gestation to 75.0 mm at 40 weeks' gestation⁶.

Material and Methods

The cases coming to outpatient wing of Obstetrics and Gynaecology department of Gian Sagar Medical College for routine checkup during pregnancy will be studied for length of femur, humerus, kidney and Biparietal diameter by Ultrasonography. This will be a random case study. 121 cases were taken in this study. Only those cases were taken where there was no mistake for last menstrual period. Consent of every volunteer will be taken. Fetus with congenital and developmental abnormalities will be excluded. During Ultrasonography length of femur and humerus will be noted. LMP of these cases will be recorded.

Results

With the help of ultrasonography length of femur, Humerus, kidney and Biparietal diameters were measured in mm and they are given below in tabulated form.

Femur

Minimum length of the femur at 15 weeks of pregnancy was 16.7 mm and maximum length of femur at 39 weeks of pregnancy was 74.2 mm.

Humerus

Minimum length of the humerus at 15 weeks of pregnancy was 17.6 mm and maximum length of humerus at 39 weeks of pregnancy was 63.8 mm.

Kidney

Minimum length of the kidney at 24 weeks of pregnancy

Table 1: Average length of femur in relation to lunar months of pregnancy

Lunar Months	Average length
4	20.77
5	27.6
6	38.75
7	49.64
8	58.54
9	66.96
10	70.3

Fig. 1: Length of femur with lunar months of pregnancy.

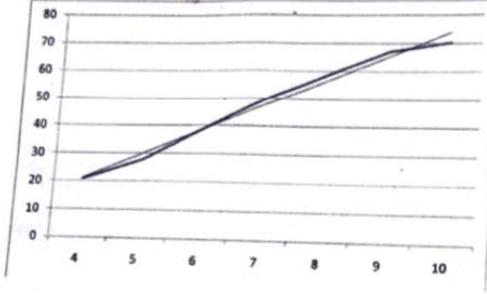


Table 3: Average length of humerus in relation to lunar months of pregnancy.

Lunar Months	Average length
4	21.21
5	27.01
6	36.3
7	44.21
8	52.42
9	57.74
10	60.85

Fig. 3: Length of humerus with lunar months of pregnancy.

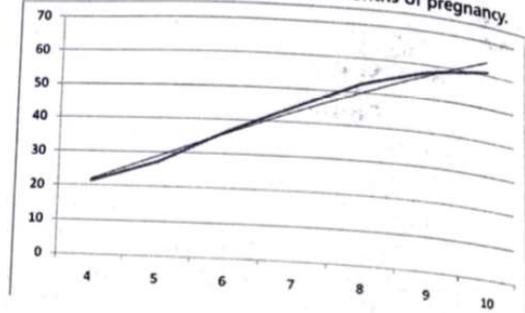


Table 2: Average length of femur in relation to weeks of pregnancy.

Weeks of Pregnancy	Average	Weeks of Pregnancy	Average
15	17.85	28	53.73
16	21.75	29	54.9
17	23.48	30	58.68
18	26.9	31	59.25
19	30.72	32	64.4
20	31.85	33	61.63
21	35.85	34	66.28
22	37.44	35	68.8
23	40.8	36	69.87
24	42.74	37	65.9
25	43	38	70.55
26	48.7	39	74.2
27	58.5		

Fig. 2: Length of femur with weeks of pregnancy.

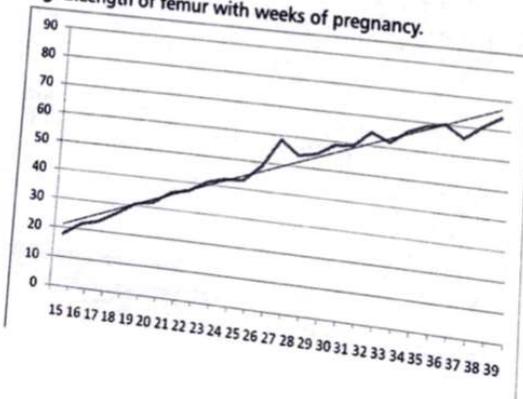


Table 4: Average length of humerus in relation to weeks of pregnancy.

Weeks of Pregnancy	Average	Weeks of Pregnancy	Average
15	18.65	28	48.77
16	22.07	29	49.62
17	22.74	30	52.35
18	26.52	31	52.95
19	29.52	32	57.17
20	32.4	33	52.86
21	33.88	34	57.61
22	35.78	35	60.02
23	38.55	36	60.7
24	38.84	37	58
25	39.96	38	60.8
26	44.03	39	63.8
27	47.1		

Fig. 4: Length of humerus with weeks of pregnancy.

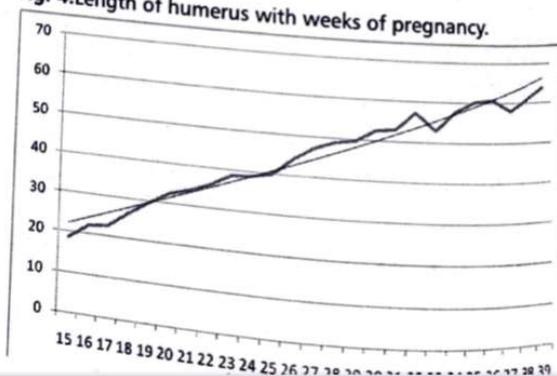


Table 5: Average length of kidney in relation to lunar months of pregnancy.

Lunar Months	Average length
4	
5	
6	23.95
7	27.38
8	31.66
9	34.03
10	36.6

Fig. 5: Length of kidney with lunar months of pregnancy.

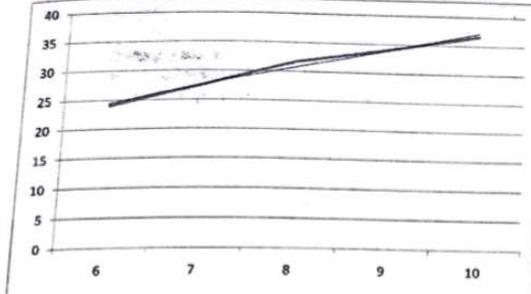


Table 7: Average Biparietal diameter of skull in relation to lunar months of pregnancy.

Lunar Months	Average length
4	35.36
5	42.21
6	54.71
7	66.06
8	76.78
9	84.35
10	89.65

Fig. 7: Biparietal diameter with lunar months of pregnancy.

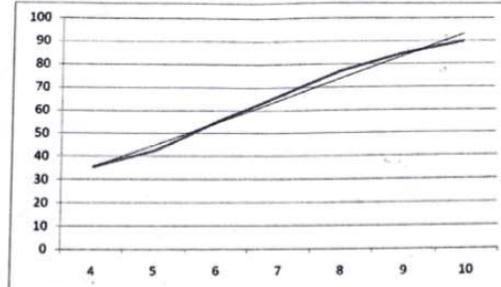


Table 6: Average length of kidney in relation to weeks of pregnancy.

Weeks of Pregnancy	Average	Weeks of Pregnancy	Average
15		28	29.16
16		29	30.51
17		30	30.17
18		31	32.43
19		32	33.72
20		33	30.97
21	24.6	34	33.57
22		35	34.72
23		36	37.23
24	23.3	37	
25	25.8	38	36.6
26	26.93	39	
27	27.9		

Fig. 6: Length of humerus with weeks of pregnancy.

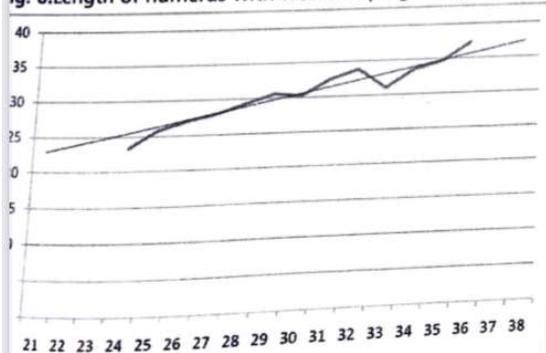


Table 8: Average Biparietal diameter in relation to weeks of pregnancy.

Weeks of Pregnancy	Average	Weeks of Pregnancy	Average
15	31.35	28	69.83
16	36.7	29	73.61
17	36.3	30	76.22
18	42.42	31	78.7
19	44.96	32	80.6
20	49.75	33	83.03
21	52.53	34	80.27
22	54.2	35	87.2
23	56.45	36	88.95
24	57.16	37	83.7
25	59.08	38	89.95
26	67.25	39	95
27	71.56		

Fig. 8: Biparietal diameter with weeks of pregnancy.

