TABLE 20. REFERENCE VALUES OF CLAVICLE LENGTH

	Jeanty[a]			Yarkoni[b]		
	Percentiles			Percentiles		
GA (wk)	5th	50th	95th	5th	50th	95th
12	8	13	18	—	—	—
13	10	15	20	—	—	—
14	11	16	21	—	—	—
15	12	17	22	11	16	21
16	13	18	23	12	17	22
17	14	19	24	13	18	23
18	15	20	25	14	19	24
19	16	21	26	15	20	25
20	17	22	27	16	21	26
21	18	23	28	17	22	27
22	20	25	30	18	23	28
23	21	26	31	19	24	29
24	22	27	32	20	25	30
25	23	28	33	21	26	31
26	24	29	34	22	27	32
27	25	30	35	23	28	33
28	26	31	36	24	29	34
29	27	32	37	25	30	35
30	29	34	39	26	31	36
31	30	35	40	27	32	37
32	31	36	41	28	33	38
33	32	37	42	29	34	39
34	33	38	43	30	35	40
35	34	39	44	31	36	41
36	35	40	45	32	37	42
37	36	41	46	33	38	43
38	37	42	47	34	39	44
39	39	44	49	35	40	45
40	40	45	50	36	41	46

GA, gestational age.
[a]From Jeanty, et al.
[b]Reproduced with permission from Yarkoni S, Schmidt W, Jeanty P, Reece EA, Hobbins JC. Clavicular measurement: a new biometric parameter for fetal evaluation. *J Ultrasound Med* 1985;4:467–470.
Note: Used modified formula to fit tabular data. Clavicle = 1.118303 + 0.988639 × GA (SD 2.920)

TABLE 18. REFERENCE VALUES FOR FOOT LENGTH

GA (wk)	Foot length (mm)		
	–2 SD	Mean	+2 SD
12	7	8	9
13	10	11	12
14	13	15	16
15	16	18	20
16	19	21	23
17	21	24	27
18	24	27	30
19	27	30	33
20	30	33	37
21	32	36	40
22	35	39	43
23	37	42	46
24	40	45	49
25	42	47	52
26	44	50	55
27	47	53	58
28	49	55	61
29	51	58	64
30	53	60	66
31	56	62	69
32	58	65	72
33	60	67	74
34	62	69	77
35	63	71	79
36	65	74	81
37	67	76	84
38	69	78	86
39	71	80	88
40	72	81	90

GA, gestational age.
Note: Modified formula to fit tabular data: foot length = $-0.02728 \times GA^2 + 4.045 \times GA - 36.74$ (range ± 11%).
Reproduced with permission from Mercer BM, Sklar S, Shariatmadar A, Gillieson MS, D'Alton ME. Fetal foot length as a predictor of gestational age. *Am J Obstet Gynecol* 1987;156:350–355.

TABLE 19. SCAPULAR LENGTH (±2 SD) COMPARED WITH GESTATIONAL AGE

Gestational age (wk)	Scapular length (mm)		
	−2 SD	Mean	+2 SD
14	10	10	10
15	11	11	11
16	12	12	12
17	13	13	13
18	14	14	14
19	14	15	15
20	15	16	16
21	16	17	17
22	17	18	18
23	18	19	19
24	19	20	20
25	20	21	21
26	21	22	22
27	22	23	23
28	23	23	24
29	24	24	25
30	25	25	26
31	26	26	27
32	27	27	28
33	28	28	29
34	29	29	30
35	30	30	31
36	31	31	32
37	32	32	32
38	33	33	33
39	34	34	34
40	35	35	35
41	35	36	36
42	36	37	37

Data from Sherer DM, Plessinger MA, Allen TA. Fetal scapular length in the ultrasonographic assessment of gestational age. *J Ultrasound Med* 1994;13:523–528.

TABLE 21. REFERENCE VALUES FOR RIB LENGTH

GA (wk)	Rib length (mm)		
	Percentiles		
	5th	50th	95th
14	1.4	2.3	3.1
15	1.6	2.5	3.3
16	1.8	2.7	3.5
17	2.0	2.9	3.7
18	2.2	3.1	3.9
19	2.5	3.3	4.1
20	2.7	3.5	4.3
21	2.9	3.7	4.5
22	3.1	3.9	4.7
23	3.3	4.1	4.9
24	3.5	4.3	5.1
25	3.7	4.5	5.3
26	3.9	4.7	5.5
27	4.1	4.9	5.7
28	4.3	5.1	5.9
29	4.5	5.3	6.1
30	4.7	5.5	6.3
31	4.9	5.7	6.5
32	5.1	5.9	6.7
33	5.3	6.1	6.9
34	5.5	6.3	7.1
35	5.7	6.5	7.3
36	5.9	6.7	7.5
37	6.1	6.9	7.8
38	6.3	7.1	8.0
39	6.5	7.3	8.2
40	6.7	7.5	8.4

GA, gestational age.
Note: Rib length = $-0.5834 + 0.203 \times$ GA (SD = 0.5).
Adapted from Abuhamad AZ, Sedule-Murphy SJ, Kolm P, Youssef H, Warsof SL, et al. Prenatal ultrasonographic fetal rib length measurement: correlation with gestational age. *Ultrasound Obstet Gynecol* 1996;7:193–196.

TABLE A–16. **Length of Fetal Long Bones (mm)**

Week No.	Humerus Percentile			Ulna Percentile			Radius Percentile			Femur Percentile			Tibia Percentile			Fibula Percentile		
	5	*50*	*95*	*5*	*50*	*95*	*5*	*50*	*95*	*5*	*50*	*95*	*5*	*50*	*95*	*5*	*50*	*95*
11	—	6	—	—	5	—	—	5	—	—	6	—	—	4	—	—	2	—
12	3	9	10	—	8	—	—	7	—	—	9	—	—	7	—	—	5	—
13	5	13	20	3	11	18	—	10	—	6	12	19	4	10	17	—	8	—
14	5	16	20	4	13	17	8	13	12	5	15	19	2	13	19	6	11	10
15	11	18	26	10	16	22	12	15	19	11	19	26	5	16	27	10	14	18
16	12	21	25	8	19	24	9	18	21	13	22	24	7	19	25	6	17	22
17	19	24	29	11	21	32	11	20	29	20	25	29	15	22	29	7	19	31
18	18	27	30	13	24	30	14	22	26	19	28	31	14	24	29	10	22	28
19	22	29	36	20	26	32	20	24	29	23	31	38	19	27	35	18	24	30
20	23	32	36	21	29	32	21	27	28	22	33	39	19	29	35	18	27	30
21	28	34	40	25	31	36	25	29	32	27	36	45	24	32	39	24	29	34
22	28	36	40	24	33	37	24	31	34	29	39	44	25	34	39	21	31	37
23	32	38	45	27	35	43	26	32	39	35	41	48	30	36	43	23	33	44
24	31	41	46	29	37	41	27	34	38	34	44	49	28	39	45	26	35	41
25	35	43	51	34	39	44	31	36	40	38	46	54	31	41	50	33	37	42
26	36	45	49	34	41	44	30	37	41	39	49	53	33	43	49	32	39	43
27	42	46	51	37	43	48	33	39	45	45	51	57	39	45	51	35	41	47
28	41	48	52	37	44	48	33	40	45	45	53	57	38	47	52	36	43	47
29	44	50	56	40	46	51	36	42	47	49	56	62	40	49	57	40	45	50
30	44	52	56	38	47	54	34	43	49	49	58	62	41	51	56	38	47	52
31	47	53	59	39	49	59	34	44	53	53	60	67	46	52	58	40	48	57
32	47	55	59	40	50	58	37	45	51	53	62	67	46	54	59	40	50	56
33	50	56	62	43	52	60	41	46	51	56	64	71	49	56	62	43	51	59
34	50	57	62	44	53	59	39	47	53	57	65	70	47	57	64	46	52	56
35	52	58	65	47	54	61	38	48	57	61	67	73	48	59	69	51	54	57
36	53	60	63	47	55	61	41	48	54	61	69	74	49	60	68	51	55	56
37	57	61	64	49	56	62	45	49	53	64	71	77	52	61	71	55	56	58
38	55	61	66	48	57	63	45	49	53	62	72	79	54	62	69	54	57	59
39	56	62	69	49	57	66	46	50	54	64	74	83	58	64	69	55	58	62
40	56	63	69	50	58	65	46	50	54	66	75	81	58	65	69	54	59	62

From Jeanty P: Fetal limb biometry. (Letter) Radiology 147:602, 1983.

Femur and Humerus Measurement Table *

Bone Length (mm)	Gestational Age (weeks)			
	Femur		Humerus	
	Predicted Mean Value	Range from 5th to 95th Percentile	Predicted Mean Value	Range from 5th to 95th Percentile
10	12.6	10.4 to 14.9	12.6	9.9 to 15.3
11	12.9	10.7 to 15.1	12.9	10.1 to 15.6
12	13.3	11.1 to 15.6	13.1	10.4 to 15.9
13	13.6	11.4 to 15.9	13.6	10.9 to 16.1
14	13.9	11.7 to 16.1	13.9	11.1 to 16.6
15	14.1	12.0 to 16.4	14.1	11.4 to 16.9
16	14.6	12.4 to 16.9	14.6	11.9 to 17.3
17	14.9	12.7 to 17.1	14.9	12.1 to 17.6
18	15.1	13.0 to 17.4	15.1	12.6 to 18.0
19	15.6	13.4 to 17.9	15.6	12.9 to 18.3
20	15.9	13.7 to 18.1	15.9	13.1 to 18.7
21	16.3	14.1 to 18.6	16.3	13.6 to 19.1
22	16.6	14.4 to 18.9	16.7	13.9 to 19.4
23	16.9	14.7 to 19.1	17.1	14.3 to 19.9
24	17.3	15.1 to 19.6	17.4	14.7 to 20.1
25	17.6	15.4 to 19.9	17.9	15.1 to 20.6
26	18.0	15.9 to 20.1	18.1	15.6 to 21.0
27	18.3	16.1 to 20.6	18.6	15.9 to 21.4
28	18.7	16.6 to 20.9	19.0	16.3 to 21.9
29	19.0	16.9 to 21.1	19.4	16.7 to 22.1
30	19.4	17.1 to 21.6	19.9	17.1 to 22.6
31	19.9	17.6 to 22.0	20.3	17.6 to 23.0
32	20.1	17.9 to 22.3	20.7	18.0 to 23.6
33	20.6	18.3 to 22.7	21.1	18.4 to 23.9
34	20.9	18.7 to 23.1	21.6	18.9 to 24.3
35	21.1	19.0 to 23.4	22.0	19.3 to 24.9
36	21.6	19.4 to 23.9	22.5	19.7 to 25.1
37	22.0	19.9 to 24.1	22.9	20.1 to 25.7
38	22.4	20.1 to 24.6	23.4	20.6 to 26.1
39	22.7	20.6 to 24.9	23.9	21.1 to 26.6
40	23.1	20.9 to 25.3	24.3	21.6 to 27.1
41	23.6	21.3 to 25.7	24.9	22.0 to 27.6
42	23.9	21.7 to 26.1	25.3	22.5 to 28.0
43	24.3	22.1 to 26.6	25.7	23.0 to 28.6
44	24.7	22.6 to 26.9	26.1	23.6 to 29.0
45	25.0	22.9 to 27.1	26.7	24.0 to 29.6
46	25.4	23.1 to 27.6	27.1	24.6 to 30.0
47	25.9	23.6 to 28.0	27.7	25.0 to 30.6
48	26.1	24.0 to 28.4	28.1	25.6 to 31.0
49	26.6	24.4 to 28.9	28.9	26.0 to 31.6
50	27.0	24.9 to 29.1	29.3	26.6 to 32.0
51	27.4	25.1 to 29.6	29.9	27.1 to 32.6
52	27.9	25.6 to 30.0	30.3	27.6 to 33.1
53	28.1	26.0 to 30.4	30.9	28.1 to 33.6
54	28.6	26.4 to 30.9	31.4	28.7 to 34.1
55	29.1	26.9 to 31.3	32.0	29.1 to 34.7
56	29.6	27.2 to 31.7	32.6	29.9 to 35.3
57	29.9	27.7 to 32.1	33.1	30.3 to 35.9
58	30.3	28.1 to 32.5	33.6	30.9 to 36.4
59	30.7	28.6 to 32.9	34.1	31.4 to 36.9
60	31.1	28.9 to 33.3	34.9	32.0 to 37.6
61	31.6	29.4 to 33.9	35.3	32.6 to 38.1
62	32.0	29.9 to 34.1	35.9	33.1 to 38.7
63	32.4	30.1 to 34.6	36.6	33.9 to 39.3
64	32.9	30.7 to 35.1	37.1	34.4 to 39.9
65	33.4	31.1 to 35.6	37.7	35.0 to 40.6
66	33.7	31.6 to 35.9	38.3	35.6 to 41.1
67	34.1	32.0 to 36.4	38.9	36.1 to 41.7
68	34.6	32.4 to 36.9	39.6	36.9 to 42.3
69	35.0	32.6 to 37.1	40.1	37.4 to 42.9
70	35.6	33.3 to 37.7	—	—
71	35.9	33.7 to 38.1	—	—
72	36.4	34.1 to 38.6	—	—
73	36.9	34.6 to 39.0	—	—
74	37.3	35.1 to 39.6	—	—
75	37.7	35.6 to 39.9	—	—
76	38.1	36.0 to 40.4	—	—
77	38.6	36.4 to 40.9	—	—
78	39.1	36.9 to 41.3	—	—
79	39.6	37.3 to 41.7	—	—
80	40.0	37.9 to 42.1	—	—

* From Jeanty P, Rodesch F, Delbeke D, Dumont JE: Estimation of gestational age from measurements of fetal long bones. *J Ultrasound Med* 3:75-79, 1984.

"Corrected Biparietal Diameter (BPD)" *

Area-Corrected BPD (BPDa)

$$BPDa = \sqrt{(BPD \times FOD) / 1.265}$$

* Doubilet PM, Greenes RA: Improved prediction of gestational age from fetal head measurements, *AJR*, 142:797-800, 1984.

(4)

Cephalic Index Formula †*

$$\text{Cephalic Index} = \frac{\text{Short Axis (Biparietal Diameter)}}{\text{Long Axis (Frontal Occipital Diameter)}} \times 100 = 78.3 \quad (78 \pm 4\%)$$

mean

Normal Range

At 2 Standard Deviation = ~~78 to 86~~

.74 - .82

† Measurements of short and long axis taken from outer to outer margins of head

* From Hadlock FP, Deter RL, Carpenter RJ, Park SK: Estimating fetal age: effect of head shape on BPD. *AJR* 137:83-85, 1981

Should You Correct the BPD?

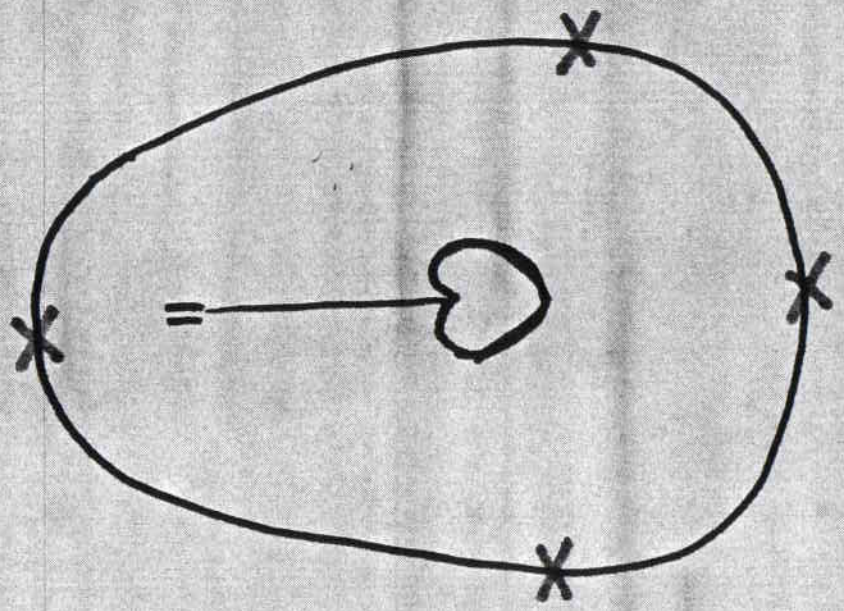
Normal cephalic index is

BPD ÷ OFD = .78 ± .04 (Callen 4th ed.)

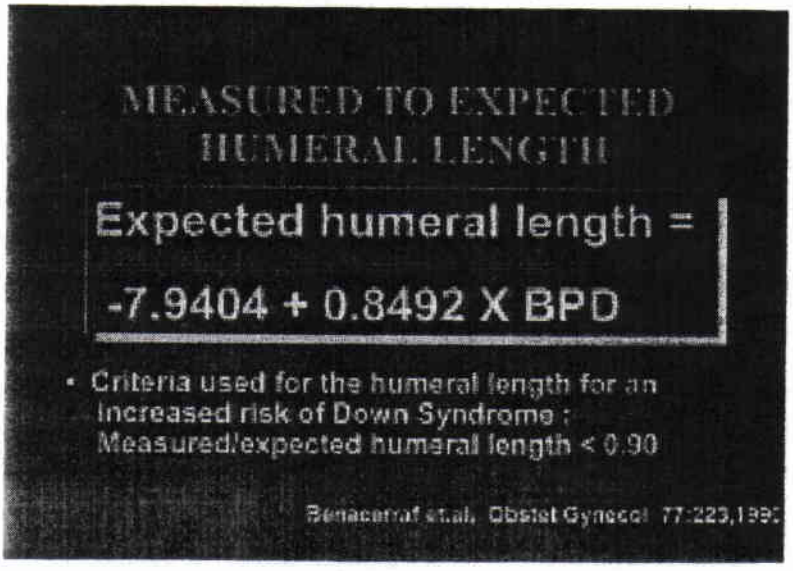
so.....

You should correct if CI is <.74 or >.82

<74 or >.84



= [(BPD (mm) × 0.9028] − 9.3105 = Exp. FL (mm)



= (BPD (mm) × 0.8492] − 7.9404 = Exp HL (mm)

FEMUR AND HUMERUS MEASUREMENTS

Measured to expected femur length ratio:

Expected femur length(mm)=0.9028 X BPD(mm) – 9.3105

$$\frac{\text{Measured}}{\text{Expected}}$$ **Normal Ratio is 0.91**

Measured to expected humerus length ratio:

Expected ~~femur~~ humerus length(mm)=0.8492 X BPD(mm) – 7.9404

$$\frac{\text{Measured}}{\text{Expected}}$$ **Normal Ratio is 0.90**

Cardiac Circumference / Thoracic Circumference = (N) < 60%.

TABLE 8–8.
Fetal Thoracic Circumference Measurements*†

Gestational Age (wk)	No.	Predictive Percentiles								
		2.5	5	10	25	50	75	90	95	97.5
16	6	5.9	6.4	7.0	8.0	9.1	10.3	11.3	11.9	12.4
17	22	6.8	7.3	7.9	8.9	10.0	11.2	12.2	12.8	13.3
18	31	7.7	8.2	8.8	9.8	11.0	12.1	13.1	13.7	14.2
19	21	8.6	9.1	9.7	10.7	11.9	13.0	14.0	14.6	15.1
20	20	9.5	10.0	10.6	11.7	12.9	13.9	15.0	15.5	16.0
21	30	10.4	11.0	11.6	12.6	13.7	14.8	15.8	16.4	16.9
22	18	11.3	11.9	12.5	13.5	14.6	15.7	16.7	17.3	17.8
23	21	12.2	12.8	13.4	14.4	15.5	16.6	17.6	18.2	18.8
24	27	13.2	13.7	14.3	15.3	16.4	17.5	18.5	19.1	19.7
25	20	14.1	14.6	15.2	16.2	17.3	18.4	19.4	20.0	20.6
26	25	15.0	15.5	16.1	17.1	18.2	19.3	20.3	21.0	21.5
27	24	15.9	16.4	17.0	18.0	19.1	20.2	21.3	21.9	22.4
28	24	16.8	17.3	17.9	18.9	20.0	21.2	22.2	22.8	23.3
29	24	17.7	18.2	18.8	19.8	21.0	22.1	23.1	23.7	24.2
30	27	18.6	19.1	19.7	20.7	21.9	23.0	24.0	24.6	25.1
31	24	19.5	20.0	20.6	21.6	22.8	23.9	24.9	25.5	26.0
32	28	20.4	20.9	21.5	22.6	23.7	24.8	25.8	26.4	26.9
33	27	21.3	21.8	22.5	23.5	24.6	25.7	26.7	27.3	27.8
34	25	22.2	22.8	23.4	24.4	25.5	26.6	27.6	28.2	28.7
35	20	23.1	23.7	24.3	25.3	26.4	27.5	28.5	29.1	29.6
36	23	24.0	24.6	25.2	26.2	27.3	28.4	29.4	30.0	30.6
37	22	24.9	25.5	26.1	27.1	28.2	29.3	30.3	30.9	31.5
38	21	25.9	26.4	27.0	28.0	29.1	30.2	31.2	31.9	32.4
39	7	26.8	27.3	27.9	28.9	30.0	31.1	32.2	32.8	33.3
40	6	27.7	28.2	28.8	29.8	30.9	32.1	33.1	33.7	34.2

*From Chitkara U, Rosenberg J, Chervenak FA, et al: Prenatal sonographic assessment of the fetal thorax: Normal values. Am J Obstet Gynecol 1987; 156:1069–1074. Used by permission.
†Measurements in centimeters.

the TC in axial view at the level of the four-chamber view of the heart (Figs 8–5 and 8–6). We exclude the skin and subcutaneous tissues in TC measurements for two reasons (1) the size of the thoracic cage, rather than the thickness of the subcutaneous tissues, probably affects underlying lung development, and (2) abnormalities which adversely affect the thorax (for example, thanatophoric dysplasia, achondrogenesis, etc.) also may produce thickening of the subcutaneous tissues.

An absolute thoracic circumference measurement less than the 5th percentile for expected values or a declining TC/AC ratio has been suggested as evidence for pulmonary hypoplasia.[4, 15, 22, 31] Both methods have potential limitations for diagnosing pulmonary hypoplasia in certain malformations. For example, malformations that produce an intrathoracic mass (herniated intra-abdominal contents, pleural effusions, cystic adenomatoid malformation of the lung, etc.) may compromise lung growth by direct compression but still result in a normal or near normal chest circumference.[27, 28] However, the TC/AC ratio may be altered by malformations that produce either an abnormally small abdominal circumference (severe growth retardation, diaphragmatic hernia, gastroschisis, etc.) or abnormally large abdominal circumference (ascites or abdominal mass, most commonly of renal origin).

Measurements of normal fetal cardiac size are also available (see Chapter 9).[4] The biventricular outer dimension (the transverse diameter of the heart at the level of the atrioventricular valves measured at end-diastole) increases linearly with advancing gestational age. The ratio between the biventricular outer dimension and the thoracic diameter or circumference remains constant throughout the second and third trimester in the normal fetus. Therefore, comparison of thoracic circumference and heart size measurements at a known gestational age may permit determination of normalcy or abnormalcy of cardiac or lung size. Since an increased cardiothoracic ratio may result from cardiomegaly without pulmonary hypoplasia or small lungs with a normally sized heart, a combination of ab-

Survival rates may be as high as 60% when CDH is isolated, without additional anomalies and chromosomal abnormalities.[48,49,66] However, the prognosis in this group of patients remains dependent on the volume of functional lung. In particular, three factors associated with a worse prognosis are (a) earlier diagnosis before 25 weeks, (b) intrathoracic liver, and (c) small size of the contralateral, right lung.

As prenatal detection of intrathoracic liver became more reliable, the correlation with worsened survival rate became evident[49] (Table 3). When the liver remains intraabdominal (*liver down*), postnatal survival rates are impressively optimistic (93%) compared to much poorer survival rates (43%) among those in whom the liver is intrathoracic (*liver up*).

As previously noted, a variety of methods have been used to help estimate the quantity of right lung in cases of left diaphragmatic hernia. This has included lung length, lung diameter, lung area, and LHR.[67,68]

This ratio is calculated by measuring the area of the right lung, in square millimeters, on a four-chamber image of the chest between 23 and 28 weeks (Fig. 16). Two diameters of the lung are multiplied and divided by the head circumference, in millimeters, yielding a gestational age–independent index.

In a study of 40 affected fetuses, Guibaud et al.[49] reported that the only significant predictor of survival was the quantification of the contralateral lung area at the level of an axial four-chamber view; the survival rate was 86% when the contralateral lung area was equal to or greater than one-half the area of the hemithorax compared to only 25% survival if the right lung occupied less than 50%. Similarly, Metkus et al.[69] evaluated sonographic prognostic factors in 55 fetuses with diaphragmatic hernia. The overall survival rate was 65%. If the diagnosis was made after 25 weeks' gestation, the survival rate was 100% (12 of 12); the rate was 56% if the diagnosis was made at or before 25 weeks ($p < .005$). All five neonates with an LHR of less than 0.6 died; the survival rate was 100% for those whose LHR was greater than 1.35, and those with an LHR between 0.6 and 1.35 had a 61% survival rate ($p < .001$). Stomach position, polyhydramnios, and abdominal circumference were not found to be useful survival predictors. No prenatal sonographic parameter was absolutely predictive of postnatal death except very small right lung size, which was present in only 5 of the 55 patients. At University of California San Francisco there have been no survivors without fetal intervention when the LHR was less than 0.8, and there has been 100% survival among those with an LHR greater than 1.4.[70] Study on the efficacy (ROC curves, inter- and intraobserver variability) of the LHR is ongoing.

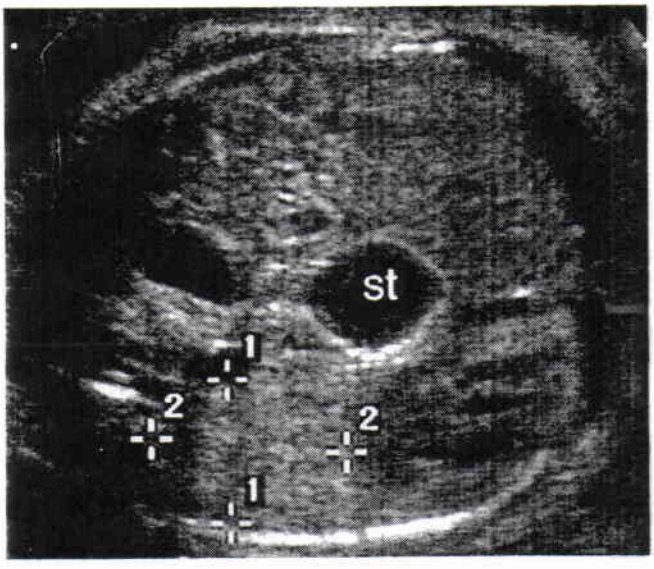


FIGURE 16. Fetal lung measurement for the calculation of the lung to head ratio in left-sided congenital diaphragmatic hernia. The measurement of the right lung is performed on a transaxial image demonstrating four cardiac chambers. The two diameters of the right lung, in millimeters, are multiplied and divided by the head circumference, also in millimeters. A lung to head ratio greater than or equal to 1.4 is considered favorable, and less than or equal to 0.8 is considered unfavorable. st, stomach.

Lung Hypoplasia

For survivors of surgical repair of the diaphragmatic hernia, morbidity may still be considerable and should be factored into parental counseling. Common complications include feeding dysfunction, gastroesophageal reflux, chronic lung disease, and delays in motor development.[71] Among fetuses with large CDHs, many require extracorporeal membrane oxygenation (ECMO) therapy. Survivors who require ECMO have a greater incidence of neurologic delay than those who do not, but this may reflect the severity of the presenting illness rather than the effects of ECMO.[72]

TABLE A–19. **Predicted Menstrual Ages for Transverse Cerebellar Diameters of 14 to 56 mm**

Cerebellum Diameter (mm)	Menstrual Age (wk)	Cerebellum Diameter (mm)	Menstrual Age (wk)
14	15.2	35	29.4
15	15.8	36	30.0
16	16.5	37	30.6
17	17.2	38	31.2
18	17.9	39	31.8
19	18.6	40	32.3
20	19.3	41	32.8
21	20.0	42	33.4
22	20.7	43	33.9
23	21.4	44	34.4
24	22.1	45	34.8
25	22.8	46	35.3
26	23.5	47	35.7
27	24.2	48	36.1
28	24.9	49	36.5
29	25.5	50	36.8
30	26.2	51	37.2
31	26.9	52	37.5
32	27.5	54	38.0
33	28.1	55	38.3
34	28.8	56	38.5

Variability Estimates (±2 SD)

12–18 wk	±1.0 wk
18–24 wk	±1.8 wk
24–30 wk	±2.0 wk
30–36 wk	±2.4 wk
36–42 wk	±3.2 wk

From Hill LM, Guzick D, Fries J, et al: The transverse cerebellar diameter in estimating gestational age in the large-for-gestational-age fetus. Reprinted with permission from the American College of Obstetricians and Gynecologists (Obstetrics and Gynecology 1990, 75:983).

TABLE A–20. **Nomogram of the Transverse Cerebellar Diameter According to Percentile Distribution**

Gestational Age (wk)	Cerebellum Diameter (mm)				
	10	*25*	*50*	*75*	*90*
15	10	12	14	15	16
16	14	16	16	16	17
17	16	17	17	18	18
18	17	18	18	19	19
19	18	18	19	19	22
20	18	19	20	20	22
21	19	20	22	23	24
22	21	23	23	24	24
23	22	23	24	25	26
24	22	24	25	27	28
25	23	21.5	28	28	29
26	25	28	29	30	32
27	26	28.5	30	31	32
28	27	30	31	32	34
29	29	32	34	36	38
30	31	32	35	37	40
31	32	35	38	39	43
32	33	36	38	40	42
33	32	36	40	43	44
34	33	38	40	41	44
35	31	37	40.5	43	47
36	36	29	43	52	55
37	37	37	45	52	55
38	40	40	48.5	52	55
39	52	52	52	55	55

From Goldstein I, Reece A, Pilu G, et al: Cerebellar measurements with ultrasonography in the evaluation of fetal growth and development. Am J Obstet Gynecol 156:1065, 1987.

TABLE 24. REFERENCE VALUES FOR BINOCULAR DIAMETER, INTEROCULAR DIAMETER, AND OCULAR DIAMETER BY GESTATIONAL AGE

Gestational age (wk)	Binocular diameter (mm)			Interocular diameter (mm)			Ocular diameter (mm)		
	Percentiles			Percentiles			Percentiles		
	5th	50th	95th	5th	50th	95th	5th	50th	95th
11	5	13	20	—	—	—	—	—	—
12	8	15	23	4	9	13	1	3	6
13	10	18	25	5	9	14	2	4	7
14	13	20	28	5	10	14	3	5	8
15	15	22	30	6	10	14	4	6	9
16	17	25	32	6	10	15	5	7	9
17	19	27	34	6	11	15	5	8	10
18	22	29	37	7	11	16	6	9	11
19	24	31	39	7	12	16	7	9	12
20	26	33	41	8	12	17	8	10	13
21	28	35	43	8	13	17	8	11	13
22	30	37	44	9	13	18	9	12	14
23	31	39	46	9	14	18	10	12	15
24	33	41	48	10	14	19	10	13	15
25	35	42	50	10	15	19	11	13	16
26	36	44	51	11	15	20	12	14	16
27	38	45	53	11	16	20	12	14	17
28	39	47	54	12	16	21	13	15	17
29	41	48	56	12	17	21	13	15	18
30	42	50	57	13	17	22	14	16	18
31	43	51	58	13	18	22	14	16	19
32	45	52	60	14	18	23	14	17	19
33	46	53	61	14	19	23	15	17	19
34	47	54	62	15	19	24	15	17	20
35	48	55	63	15	20	24	15	18	20
36	49	56	64	16	20	25	16	18	20
37	50	57	65	16	21	25	16	18	21
38	50	58	65	17	21	26	16	18	21

Reproduced with permission from Romero R, Pilu G, Jeanty F, et al. *Prenatal diagnosis of congenital anomalies.* Norwalk, CT: Appleton & Lange, 1988:83.

TABLE 1: Mean Renal Lengths for Various Gestational Ages

Gestational Age (weeks)	Mean Length (cm)	SD	95% CI	*n*
18	2.2	0.3	1.6–2.8	14
19	2.3	0.4	1.5–3.1	23
20	2.6	0.4	1.8–3.4	22
21	2.7	0.3	2.1–3.2	20
22	2.7	0.3	2.0–3.4	18
23	3.0	0.4	2.2–3.7	13
24	3.1	0.6	1.9–4.4	13
25	3.3	0.4	2.5–4.2	9
26	3.4	0.4	2.4–4.4	9
27	3.5	0.4	2.7–4.4	15
28	3.4	0.4	2.6–4.2	19
29	3.6	0.7	2.3–4.8	12
30	3.8	0.4	2.9–4.6	24
31	3.7	0.5	2.8–4.6	23
32	4.1	0.5	3.1–5.1	23
33	4.0	0.3	3.3–4.7	28
34	4.2	0.4	3.3–5.0	36
35	4.2	0.5	3.2–5.2	17
36	4.2	0.4	3.3–5.0	36
37	4.2	0.4	3.3–5.1	40
38	4.4	0.6	3.2–5.6	32
39	4.2	0.3	3.5–4.8	17
40	4.3	0.5	3.2–5.3	10
41	4.5	0.3	3.9–5.1	4

Note.—Gestational age is an average of the gestational ages in weeks ermined on the basis of biparietal diameter, femoral length, and abdominal umference. SD = standard deviation, 95% CI = 95% confidence interval, number of fetuses. A t distribution was used when $n < 30$.

Fetal Liver Measurement Table *

Gestational Age (weeks)	Long Axis Measurement (mm) †	
	True Mean	Range from 5th to 95th Percentile
20	27.3	20.9 to 33.7
21	28.0	26.5 to 29.5
22	30.6	23.9 to 37.3
23	30.9	26.4 to 35.4
24	32.9	26.2 to 39.6
25	33.6	28.3 to 38.9
26	35.7	29.4 to 42.0
27	36.6	33.3 to 39.9
28	38.4	34.4 to 42.4
29	39.1	34.1 to 44.1
30	38.7	33.7 to 43.7
31	39.6	33.9 to 45.3
32	42.7	35.0 to 50.2
33	42.8	37.2 to 50.4
34	44.8	37.7 to 51.9
35	47.8	38.7 to 56.9
36	49.0	40.6 to 57.4
37	52.0	45.2 to 58.8
38	52.9	48.7 to 57.1
39	55.4	48.7 to 62.1
40	59.0	—
41	49.3	46.9 to 51.7

† Measured in longitudinal plane from top of right hemidiaphragm to tip of right lobe of liver

* From Vintzileos AM, Neckles S, Campbell WA, Anreoli JW, Kaplan BM, Nochimson DJ: Fetal liver ultrasound measurements during normal pregnancy. *Obstet Gynecol* 66:477-480, 1985.

Table 1: Fetal Gallbladder Length and Anteroposterior and Transverse Diameters from 15 to 40 Weeks' Gestation

Gestational Age (weeks)	N	Length		Anteroposterior		Transverse	
		Mean ±2 SD	Range (mm)	Mean ±2 SD	Range (mm)	Mean ±2 SD	Range (mm)
15–16.9	19	7 ± 3	(4–10)	3 ± 1	(2–4)	4 ± 1	(3–5)
17–18.9	29	9 ± 3	(6–12)	3 ± 1	(2–4)	4 ± 1	(3–5)
19–20.9	28	12 ± 2	(10–14)	4 ± 1	(3–5)	5 ± 1	(4–6)
21–22.9	21	16 ± 4	(12–20)	4 ± 1	(3–5)	5 ± 2	(3–7)
23–24.9	25	17 ± 3	(14–20)	5 ± 1	(4–6)	6 ± 2	(4–8)
25–26.9	13	19 ± 3	(16–22)	5 ± 1	(4–6)	6 ± 2	(4–8)
27–28.9	14	20 ± 4	(16–24)	6 ± 2	(4–8)	6 ± 1	(5–7)
29–30.9	23	23 ± 5	(18–28)	6 ± 1	(5–7)	8 ± 2	(6–10)
31–32.9	22	25 ± 6	(19–31)	6 ± 2	(4–8)	8 ± 2	(6–10)
33–34.9	34	23 ± 5	(18–28)	6 ± 2	(4–8)	7 ± 2	(5–9)
35–36.9	36	25 ± 5	(20–30)	6 ± 2	(4–8)	8 ± 3	(5–11)
37–38.9	20	26 ± 8	(18–34)	6 ± 2	(4–8)	6 ± 2	(4–8)
39–40.0	16	26 ± 7	(19–33)	6 ± 2	(4–8)	6 ± 2	(4–8)

mm, with intraobserver variability of 0.8 ± 0.7 mm. Figures 3 to 5 describe the measured mean (±2 SD) fetal gallbladder dimensions and gestational ages with their respective second order polynomial curve. The regression formula for each mean measurement and gestational age is given with its respective figure. The regression formulas for the calculated mean fetal gallbladder area, volume, and sagittal perimeter are as follows: (1) area = $-50.203 + (5.071 \times GA - 0.064\ GA^2)$; $R^2 = 0.98$; (2) volume = $-1002.75 + (73.73 \times GA - 0.803\ GA^2)$; $R^2 = 0.905$; and (3) sagittal perimeter = $-34.152 + (3.524 \times GA - 0.045\ GA^2)$ where $R^2 = 0.979$. GA is gestational age in weeks; area is expressed in mm^2; volume is expressed in mm^3; sagittal perimeter is expressed in mm.

DISCUSSION

The advent of high-resolution real-time ultrasonography has advanced the field of prenatal diagnosis as well as the study of fetal growth and development. The fetal gallbladder is an hypoechoic oblong cystic structure located at a 30 to 45 degree angle to the right of the umbilical vein in the upper abdomen (Fig. 1). It can be differentiated from the umbilical vein, which is tubular in shape and inserted centrally into the fetal anterior abdominal wall. Occasionally, the use of pulsed or color Doppler ultrasonography may facilitate the differential diagnosis. In our study, we did not have to resort to the use of Doppler interrogation for the identification or location of the fetal gallbladder.

Table 2: Fetal Gallbladder Area, Volume, and Sagittal Perimeter from 15 to 40 Weeks' Gestation

Gestational Age (weeks)	N	Area		Volume		Perimeter	
		Mean (±2 SD)	Range (mm^2)	Mean (±2 SD)	Range (mm^3)	Mean (±2 SD)	Range (mm)
15–16.9	19	16 ± 6	(10–22)	—	—	12 ± 5	(7–17)
17–18.9	29	19 ± 5	(14–24)	59 ± 42	(17–101)	14 ± 4	(10–18)
19–20.9	28	25 ± 4	(21–29)	109 ± 50	(59–159)	18 ± 3	(15–21)
21–22.9	21	31 ± 7	(24–38)	197 ± 62	(135–345)	22 ± 5	(17–27)
23–24.9	25	33 ± 6	(27–39)	240 ± 105	(135–345)	24 ± 4	(20–28)
25–26.9	13	37 ± 6	(31–43)	298 ± 143	(155–441)	26 ± 4	(22–30)
27–28.9	14	41 ± 8	(33–49)	409 ± 211	(198–620)	29 ± 5	(24–34)
29–30.9	23	46 ± 8	(38–54)	588 ± 258	(330–846)	33 ± 6	(27–39)
31–32.9	22	50 ± 11	(39–61)	691 ± 417	(274–1108)	35 ± 8	(27–43)
33–34.9	34	45 ± 9	(36–54)	508 ± 396	(112–904)	32 ± 6	(26–38)
35–36.9	36	49 ± 10	(39–59)	666 ± 448	(218–1114)	35 ± 7	(28–42)
37–38.9	20	49 ± 14	(35–63)	595 ± 504	(91–1098)	35 ± 9	(26–44)
39–40.0	16	50 ± 12	(38–62)	625 ± 461	(164–1086)	35 ± 8	(27–43)

TABLE 37. NORMAL COLON DIAMETERS

Gestational age (wk)	Colon diameters (mm)		
	–2 SD	Mean	+2 SD
22	2	4	6
24	3	5	7
26	4	6	9
28	4	7	10
30	5	8	11
32	6	9	12
34	7	10	13
36	8	12	16
38	9	14	18
40	10	16	20

Data adapted from Harris RD, Nyberg DA, Mack LA, Weinberger E. Anorectal atresia: prenatal sonographic diagnosis. *AJR Am J Roentgenol* 1987;149:395–400.

reported a nomogram including mean and ±SD values of fetal gastric size dimensions (longitudinal, transverse and anteroposterior) by gestational age in 152 fetuses between 9 to 40 weeks of gestation. Similar to our finding, they found a positive correlation between fetal gastric dimensions and gestational age.

Sase et al. [12] collected a total of 386 fetal gastric measurements from routine ultrasonographic examinations of women with normal singleton pregnancies

area ratio is constant during pregnancy. Moreover, the reported that the standard deviation of the normal gastri measurements increases markedly with advanced ges tational age thus limiting the ability to use abnormalitie of stomach size in cases with congenital digestive trac anomalies, particularly in mid to late gestation.

In the study of Nagata et al. [9], measurements of th fetal gastric maximal longitudinal and anteroposteric dimensions were obtained by real-time ultrasound imag

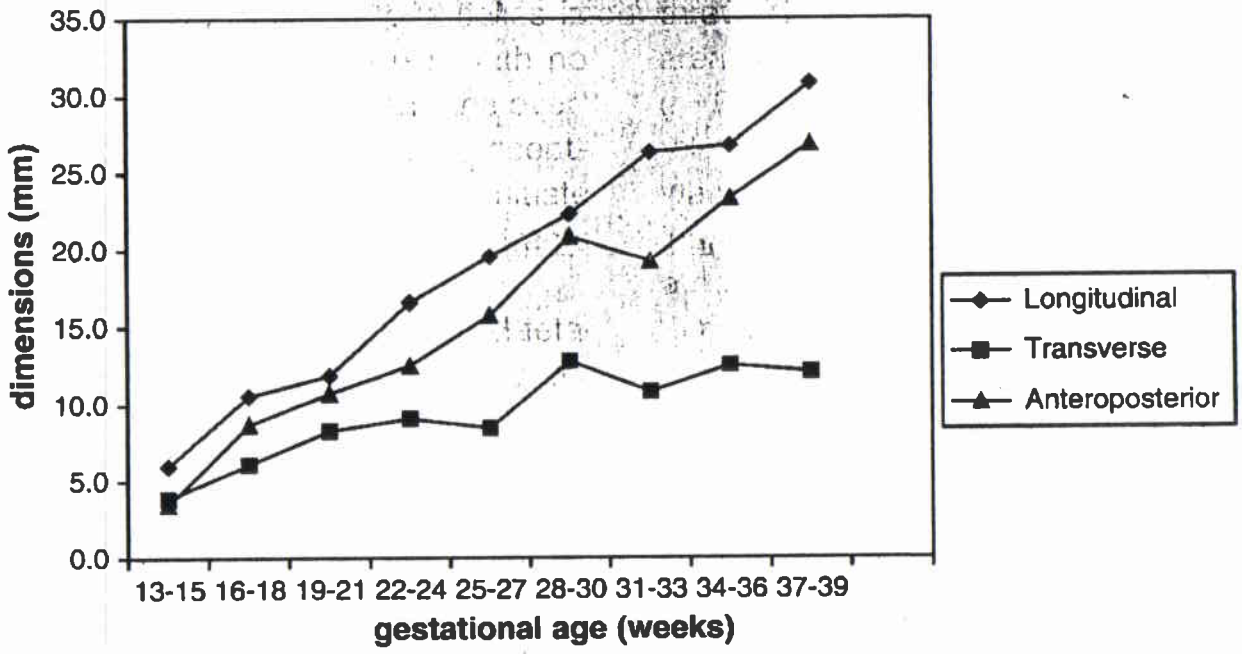


Figure 2 Correlation between fetal gastric size dimensions and gestational age.