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The Influence of Birth Order and Presentation on Intrauterine Growth of Twins

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Abstract. In order to evaluate the influence of birth order and fetal presentation on antenatal growth of twins we conducted a comparison of prospective measurements of five fetal biometric indices in 50 vertex-vertex and 47 vertex-breech twins. We compared (a) twin A to twin B in both groups; (b) the second and (c) the first twins of both groups. Both groups had similar maternal and neonatal characteristics. The growth curves of the twins were also very similar except for three significant ($p<0.05$) deviations: (a) Twin A of the vertex-vertex group, had larger femur length (FL) at 18-19 weeks, abdominal circumference (AC) and estimated fetal weight (EFW) at 29 weeks, and EFW measurements at 36 weeks. (b) Second breech twins, compared to their second vertex cohorts, had significantly smaller biparietal diameter (BPD), head circumference (HC) and FL at 18-19 weeks, BPD and HC at 29 weeks, and EFW at 37 weeks. (c) First twins of the vertex-breech group, as compared to first twins of the vertex-vertex group, had significantly smaller BPD and AC at 18-19 weeks, FL and AC at 21-22 and 29 weeks, FL at 31 weeks, and EFW at 27-28 and 36 weeks' gestation. We concluded that significantly different sonographic fetal indices may be measured at about 20 and 30 weeks' gestation, but not later. An adaptive mechanism attributed to fetal presentation is suggested to explain similar birthweights in spite of these antepartum differences.

Key words: Birth order, Fetal presentation, Antenatal growth

INTRODUCTION

The ability to evaluate fetal growth is one of the important achievements of obstetrical sonography. Since disturbed growth is encountered more frequently in twins than in singletons, the importance of an accurate antenatal growth assessment of twin gestations is evident. Sonographically derived growth curves are based on measurements of fetal indices throughout gestation in the same patient (longitudinal studies) or on cross-sectional measurements of a single index in different patients at the same gestational week. It was suggested from singleton pregnancies [3,4] that longitudinal curves are more accurate than cross-sectional curves; however, recent comparisons yielded similar accuracies [10].

Growth analyses of twin gestations employing different methods focused mainly on the differences between twins and singletons [5,8,9,11-13,16]. Because of the relatively small samples, most studies did not address the possible influence of birth order and none considered how presentation may affect intrauterine growth in twins. The purpose of the current study was to evaluate the influence of these variables on prenatal growth of twins.

MATERIALS AND METHODS

In the last 5 years we prospectively followed twin gestations by sonographic biometry approximately every month. The data were stored in the personal files of the patients for future assessments. All patients had at least four biometric studies of their twin fetuses after 18 weeks gestation. Since recruitment to the study was not at the same gestational age, sonographic studies varied longitudinally across the 18-40 week interval. The study group was composed of 97 twin pairs that met the following criteria: (1) established gestional age (by known last menstrual period confirmed by first trimester sonography); (2) no evidence of fetal-maternal morbidity that may have influenced fetal growth (ie. hypertensive disorders of pregnancy, diabetes, chronic maternal disease, suspected twin-twin transfusion, etc); (3) at least four biometric assessments, each including a minimum of three comparable variables of both twins; (4) certainty of birth order (identified as right/left or upper/lower fetus) from recruitment to the study until delivery. Only pairs that maintained the same presentation combination during successive sonography were included in the study; (5) Only diamniotic twins were included. Cases with oligohydramnios or polyhydramnios severe enough to affect measurements were excluded. Data concerning maternal age and parity, gestational age at delivery, birthweight of both twins, and inter-twin birthweight discordance (calculated on the larger twin being 100%) were obtained from the delivery charts.

The biometric indices included: (i) biparietal diameter (BPD), measured at the level of the thalami (leading edge to leading edge); (ii) femur length (FL), measured as the distance between proximal and distal diaphyses; (iii) head circumference (HC), measured at the level of the thalami; (iv) abdominal circumference (AC), measured at the level of the umbilical vein – ductus venosus complex [circumferences were calculated by the formula (D1 + D2) × 3.14/2, where D1 and D2 are the anteroposterior and transverse diameters, respectively]; (v) estimated fetal weight (EFW), calculated by the Hadlock et al [6] formula where FL and AC measurements were available, or by the Shepard et al [15] formula where BPD and AC measurements were available. All measurements were taken by experienced sonographers using the abdominal approach, linear or sector array transducers of 3.5 mHz and General Electric RT 3000 machines with freeze-frame capability and on-screen calipers.

Fifty pairs in the vertex-vertex presentation constituted group I and 47 pairs in the vertex-breech presentation comprised group II. In order to assess the influence of birth order, we compared the growth curve of twin A to that of twin B in both groups. To evaluate the influence of presentation, we compared the second twin in group I to the second twin in group II. In addition, we compared vertex-first twins of both groups in order to assess the influence of the different presentation of their cotwins. The measurements of each parameter at a given gestational age were compared by the SPSS statistic package using Student's t-test, and re-checked by the Wilcoxon rank-sum test. A p-value of <0.05 was considered significant.

RESULTS

The intergroup comparison of the maternal and neonatal variables shown in Table 1 indicates similarity in the mean maternal age and parity, mean gestational age at delivery, mean birthweight of first-born and second-born twins, and in the mean birthweight discordance. Table 1 also details the number of measurements of each parameter, upon

Table 1a - Maternal and neonatal characteristics of the twins (Mean + SD)

	Group I (Vx-Vx) n = 50	Group II (Vx-Br) n = 47	P
Maternal age (yr)	28.7 ± 5.2	29.7 ± 5.1	0.39
Parity	2.4 ± 1.3	2.6 ± 1.7	0.36
Gestational age (wk)	37.8 ± 5.9	37.4 ± 7.0	0.40
Birthweight			
Twin A (g)	2492 ± 517	2403 ± 562	0.42
Twin B (g)	2510 ± 498	2398 ± 568	0.30
Discordancy (%)	10.7 ± 7.6	12.4 ± 9.5	0.31

Table 1b - Number of measurements (numbers in brackets represent frequency of each measurement per twin)

	Group I		Group II		Total
	Twin A	Twin B	Twin A	Twin B	
BPD	224 (4.5)	226 (4.5)	165 (3.5)	166 (3.5)	781 (4.0)
HC	144 (2.9)	145 (2.9)	99 (2.1)	103 (2.2)	491 (2.5)
FL	239 (4.8)	237 (4.7)	165 (3.5)	166 (3.5)	807 (4.2)
AC	192 (3.8)	194 (3.9)	132 (2.8)	131 (2.8)	649 (3.3)
EFW	170 (3.4)	172 (3.4)	108 (2.3)	110 (2.3)	560 (2.9)
Total	969 (19.4)	974 (19.5)	669 (14.2)	676 (14.4)	3288 (16.9)

which the comparisons were based. Overall, the data base consisted of 3288 entries, or about 17 measurements/twin.

Tables 2-6 present the data base itself. We chose the tabular instead of the graphic form, because multicurve figures may obscure the differences or similarities and do not permit critical re-appraisal of data, whilst the tabular form may also be used as a reference table. Comparative statistical analysis yielded the following results: Intrapair differences were found in the vertex-vertex combination only, with significantly larger measurements for twin A in FL at 18-19 weeks, in AC and EFW at 29 weeks, and in EFW at 36 weeks' gestation. Between second breech twins and their second vertex controls differences were found in BPD, HC, and FL at 18-19 weeks' gestation, in BPD and HC at 29 weeks, and in EFW at 37 weeks' gestation. Second breech twins had smaller measurements compared with second vertex twins. Firstborn twins of vertex-breech pairs had significantly smaller measurements compared to firstborn twins of vertex-vertex pairs in BPD and AC at 18-19 weeks; in FL and AC at 21-22 weeks and 29 weeks; in FL at 31 weeks, and in EFW at 27-28 and 36 weeks' gestation.

Table 2 - Measurments of the BPD [mm, mean (SD)] in vertex-vertex and vertex-breech twins

Week	Group I Vx-Vx (n=50)		Group II Vx-Br (n=47)		Different
	A	B	A	B	p<0.05
18-19	42.3 (4.2)	41.9 (4.5)	39.2 (3.2)	39.0 (3.0)	* #
20	46.8 (2.6)	46.1 (2.3)	46.2 (2.0)	46.7 (2.7)	
21-22	51.9 (3.3)	52.2 (3.0)	50.6 3.2)	50.4 (3.5)	
23-24	55.9 (3.3)	55.0 (3.5)	56.7 (2.2)	56.0 (2.7)	
25-26	59.2 (7.2)	59.3 (6.6)	60.6 (3.2)	60.4 (3.6)	
27-28	69.5 (3.2)	69.2 (4.2)	64.5 (12.4)	68.6 (3.7)	
29	69.6 (6.1)	73.5 (1.5)	71.7 (3.8)	68.8 (3.7)	*
30	75.0 (3.5)	72.6 (4.2)	76.2 (3.7)	74.5 (4.9)	
31	78.6 (4.1)	78.1 (3.2)	75.7 (2.9)	76.6 (2.8)	
32	77.3 (3.3)	75.7 (3.3)	79.0 (2.7)	78.4 (4.5)	
33	81.4 (2.7)	79.9 (4.6)	82.2 (2.47	83.0 (2.2)	
34	83.6 (2.7)	81.8 (3.3)	85.3 (2.0)	83.5 (3.9)	
35	85.3 (3.9)	84.3 (5.2)	85.3 (4.3)	82.8 (6.1)	
36	87.6 (2.3)	81.2 (18.3)	86.8 (4.1)	86.6 (2.9)	
37	86.7 (2.8)	86.7 (4.7)	89.3 (4.0)	80.9 (3.3)	
38-40	89.4 (5.1)	89.5 (5.8)	88.2 (2.5)	88.1 (3.0)	

Vx= vertex, Br=breech; * =twin B of group I vs. twin B of group II. # =twin A of group I vs. twin A of group II.

Table 3 - Measurements of the HC [mm, mean (SD)] in vertex-vertex and vertex-breech twins

Week	Group I Vx-vx (n = 50)		Group II Vx-br (n = 47)		Different
	A	B	A	B	p<0.05
18-19	156.7 (2.9)	161.4 (7.0)	149.8 (11.1)	141.8 (7.1)	*
20	175.0 (9.0)	172.0 (6.2)	174.2 (11.9)	171.7 (12.3)	
21-22	191.8 (17.2)	189.5 (20.9)	184.1 (4.0)	185.1 (7.6)	
23-24	202.6 (7.1)	206.0 (8.1)	202.5 (10.5)	204.7 (6.2)	
25-26	216.0 (26.1)	230.0 (8.4)	226.5 (13.9)	224.7 (14.1)	
27-28	254.6 (12.6)	253.2 (8.6)	249.1 (9.5)	248.3 (10.1)	
29	274.4 (14.2)	267.8 (3.8)	264.1 (12.9)	258.0 (8.1)	*
30	317.0 (15.2)	303.3 (14.1)	273.8 (10.2)	267.8 (15.1)	
31	283.8 (13.2)	280.6 (9.1)	237.3 (9.2)	240.8 (9.1)	
32	283.8 (10.0)	280.6 (12.0)	281.7 (8.7)	279.7 (13.6)	
33	291.5 (8.9)	292.0 (10.0)	286.1 (12.7)	300.2 (7.9)	
34	302.0 (13.5)	297.6 (14.7)	302.5 (11.1)	295.8 (16.8)	
35	305.6 (13.0)	295.5 (33.4)	300.0 (9.5)	301.8 (25.7)	
36	316.2 (13.3)	299.3 (33.6)	303.8 (12.0)	254.6 (13.7)	
37	306.5 (22.6)	318.4 (23.7)	317.3 (10.5)	313.2 (11.8)	
38-40	320.3 (16.2)	323.2 (17.2)	321.7 (6.1)	321.5 (6.5)	

Footnote: as in Table 2.

Table 4 - Measurements of the AC [mm, mean (SD)] in vertex-vertex and vertex-breech twins

Week	Group I Vx-vx (n = 50)		Group II Vx-br (n = 47)		Different
	A	B	A	B	p<0.05
18-19	183.6 (6.0)	140.1 (6.2)	129.0 (8.7)	127.2 (9.2)	* #
20	147.2 (4.9)	148.0 (1.0)	123.2 (6.9)	120.8 (6.6)	
21-22	175.8 (5.6)	175.8 (12.6)	159.1 (6.2)	164.0 (8.6)	#
23-24	183.8 (10.5)	185.0 (3.4)	181.7 (16.2)	187.7 (18.8)	
25-26	183.3 (24.1)	192.6 (16.5)	196.8 (15.4)	198.0 (11.8)	
27-28	223.7 (12.9)	219.9 (8.0)	221.6 (9.4)	219.0 (14.1)	
29	248.0 (2.9)	239.3 (5.7)	228.1 (12.3)	234.1 (16.9)	# @
30	244.1 (16.9)	245.5 (16.3)	243.7 (16.5)	245.3 (23.7)	
31	260.3 (8.9)	257.0 (12.9)	250.2 (14.1)	260.3 (14.6)	
32	254.8 (17.4)	260.0 (13.7)	260.7 (22.9)	255.0 (22.2)	
33	267.5 (22.7)	278.9 (16.4)	266.6 (12.8)	276.1 (14.3)	
34	279.3 (16.8)	285.1 (20.6)	282.5 (12.0)	278.3 (23.8)	
35	287.7 (19.6)	297.2 (20.9)	278.5 (17.5)	292.0 (22.5)	
36	300.4 (12.9)	331.6 (16.5)	305.0 (13.1)	297.7 (33.6)	
37	298.7 (14.4)	300.1 (9.7)	266.7 (10.3)	290.9 (66.3)	
38-40	300.5 (25.4)	306.5 (25.6)	306.1 (22.4)	309.4 (12.7)	

Footnote: as in Table 2. @ = twin A of group I vs. twin B of group I.

Table 5 - Measurements of FL [mm, mean (SD)] in vertex-vertex and vertex-breech twins

Week	Group I Vx-vx (n=50)		Group II Vx-br (n=47)		Different
	A	B	A	B	p<0.05
18-19	29.6 (3.2)	27.3 (2.1)	25.5 (3.0)	25.6 (2.8)	@
20	32.1 (1.7)	31.7 (1.4)	29.7 (3.0)	25.6 (2.8)	
21-22	37.0 (2.2)	37.1 (3.0)	34.5 (2.8)	33.0 (8.0)	#
23-24	40.4 (2.8)	40.4 (3.0)	40.0 (2.4)	41.0 (1.8)	
25-26	43.3 (5.3)	44.0 (5.5)	45.1 (3.1)	44.0 (4.6)	
27-28	50.8 (2.3)	51.3 (2.6)	50.3 (2.0)	50.0 (2.9)	
29	58.4 (6.2)	54.7 (1.4)	54.0 (2.4)	53.6 (2.0)	#
30	55.3 (3.7)	55.5 (3.2)	56.2 (2.7)	55.0 (3.8)	
31	59.8 (1.9)	58.6 (3.1)	57.0 (2.5)	58.6 (2.7)	#
32	58.4 (3.1)	58.8 (3.5)	58.9 (3.2)	58.6 (2.9)	
33	61.7 (3.0)	61.5 (3.5)	63.5 (2.5)	62.8 (2.9)	
34	63.8 (2.4)	63.6 (3.3)	65.0 (2.8)	63.8 (2.8)	
35	65.2 (3.9)	65.7 (4.6)	65.0 (2.8)	64.4 (2.5)	
36	67.9 (2.9)	66.6 (6.7)	66.7 (1.5)	66.8 (2.2)	
37	68.6 (3.9)	66.7 (2.7)	68.6 (4.8)	69.3 (5.2)	
38-40	70.6 (5.1)	70.4 (4.7)	68.5 (0.8)	69.0 (1.8)	

Footnote: as in Table 4.

Table 6 - EFW [gm, mean (SD)] in vertex-vertex and vertex-breech twins

Week	Group I Vx-vx (n=50)		Group II Vx-br (n=47)		Different
	A	B	A	B	p<0.05
27-28	1080 (143)	1070 (143)	1053 (61)	1067 (125)	
29	1448 (123)	1238 (41)	1175 (140)	1178 (190)	@ #
30	1346 (235)	1321 (190)	1364 (211)	1345 (266)	
31	1673 (163)	1573 (154)	1488 (183)	1595 (212)	#
32	1544 (257)	1581 (203)	1603 (278)	1565 (294)	
33	1807 (307)	1824 (290)	1701 (255)	1923 (219)	
34	2028 (239)	2051 (283)	2106 (195)	2014 (391)	
35	2187 (297)	2280 (416)	2050 (327)	2180 (420)	
36	2596 (362)	2366 (262)	2458 (255)	2489 (305)	@
37	2403 (283)	2315 (174)	2507 (307)	2549 (282)	*
38-40	2610 (566)	2587 (544)	2601 (357)	2622 (305)	

Footnote: as in Tables 2 and 4.

DISCUSSION

In a retrospective study based on birthweights, Blickstein and Lancet [1] suggested that twins may be arranged in specific presentation combinations in order to reduce intrau-

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terine volume and to promote fetal growth. This mechanism was proposed for second-breech twins, especially in the breech-breech combination. Since breech-breech pairs comprise less than 10% of the twin population, an adequate prospective sample may not be reached within a reasonable study period. We, therefore, decided to evaluate second-breech twins in the vertex-breech combination.

Several articles have compared the growth curve of twin A to that of twin B and found no significant difference [13,16]. Reece et al [11,12] had also suggested that intrapair differences were insignificant, although their data were not provided. Our data completely supported these observations in the second-breech pairs only, while second-vertex pairs had several smaller measurements at 18-19 and 29 weeks. Our data further suggest that being a second-breech is associated with significantly smaller head parameters at, again, 18-19 and 29 weeks' gestation. In support of our observation, one may refer to previous singleton studies [7] that suggested dolichocephaly was attributable to breech presentation and uterine crowding. The similarity in head parameters found by Reece et al [11] in twins and singletons may result from similar presentations in their study groups. We also found significantly smaller growth parameters among vertex first twins of vertex-breech pairs compared with their vertex controls of vertex-vertex pairs. Again, differences were found around the 20th and 30th week of pregnancy. As there is no comparable reference, this observation was unexpected and somewhat surprising.

Since observed differences may represent either real trends or chance events, it is important to consider how the differences were obtained. Although the two groups had essentially similar growth patterns, the differences occurred consistently in the same group of twins, clustered at specific gestational ages, and were the result of temporary growth arrest in multiple sonographic indices. The data may, therefore, represent genuine trends of growth, reaching statistical significance at around 20 and 30 weeks' gestation. Although this is the largest sample of its kind, one must, nevertheless, consider possible type II statistical errors. In addition, every sonographer has observed twins moving to different positions daily; thus, we cannot exclude the possibility that the twins changed positions after sonography and re-assumed the same position again before the next sonography. However, the selection criteria employed in this study does not support such a possibility.

Two deductions may be made from our data. First, presentation of the second twin seems important for fetal growth, and apparently also for the first cotwin. It is possible that the smaller breeches result from a similar etiology that also leads to smaller vertex cotwins. At 18 to 20 weeks, these differences may represent the beginning of an early adaptive effort which lasts until a second critical age at around 30 weeks, when a later adaptive process takes place. This may also explain why intrapair differences were observed in the vertex-vertex but not in the vertex-breech group. The decrease in growth increment of the BPD and AC in twins compared to singletons [2,16], at these specific dates indirectly supports our observation. In addition, Rodis et al [14] found that many twins who are ultimately discordant at birth (ie. without adaptation), exhibit differences in ultrasonic parameters as early as 23-24 weeks' gestation, and that the smaller demonstrated a slower growth rate. Regretably, they did not consider birth order and presentation in their study. Second, data suggest that significant variations in fetal sonographic indices during these periods may be transient and, therefore, repeated sonographic fetal biometry might possibly disclose the true growth pattern.

Finally, although inferred from available growth curves, the prediction of the inter-twin birthweight relationship performed by sonographic biometry remote from term must be critically and prospectively challenged. This study suggests that, at least around the 20th and 30th week of gestation, fetal presentation should be considered in the interpretation of sonographic measurements.

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