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The Intrauterine Growth of the Biparietal Diameter of Twins

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A series of 978 repeated ultrasonic measurements of the fetal biparietal diameter (BPD) assessed the growth of 119 twin pairs during the second half of pregnancy. The mean BPD values for each gestational week were close to the mean values for singletons. From the 32nd week, the BPD growth curves for twins deviated from that for singletons. The second twins' growth curve ran consistently below that of the first and fell away more from the 32nd week on. In 80% of the measurements, the first twin (defined as the twin in, or close to, the pelvic inlet) was the one with the largest BPD. The intrapair difference in BPD had no correlation to the intrapair difference in body length, head circumference, or birth weight. In 91 of the 119 twin pairs, zygosity was settled by sex, histological examination of placenta, or blood grouping. The longitudinally compiled BPD growth curves (678 BPD determinations) showed the curve for dizygotic twins consistently running above that of the monozygotic twins. The BPD differences between the first and the second twin remained also within mono- and dizygotic groups of twins.

Key words: **Prenatal growth, Biparietal diameter, Diagnostic ultrasound, Transfusion syndrome, Twin pregnancy**

INTRODUCTION

The intrauterine growth of twins is usually established from end-point observations of birth weight at various gestational ages [7, 9, 10]. Such growth charts show the average age-related birth weight to be lower for twins in the last trimester than for singletons. The introduction of diagnostic ultrasound allowed more exact measurements of the intrauterine fetal growth [6, 12]. The present study evaluated the biparietal diameter (BPD) growth of twins compared to singletons, the relation between the first and the second twin, and the influence of zygosity.

MATERIALS AND METHODS

Since 1973, ultrasonic screening has been performed on practically all pregnant women who delivered at the University Hospital in Malmö. This screening programme detects 90% of the twin pregnancies in the second trimester. The intrauterine growth of the twins was usually longitudinally monitored

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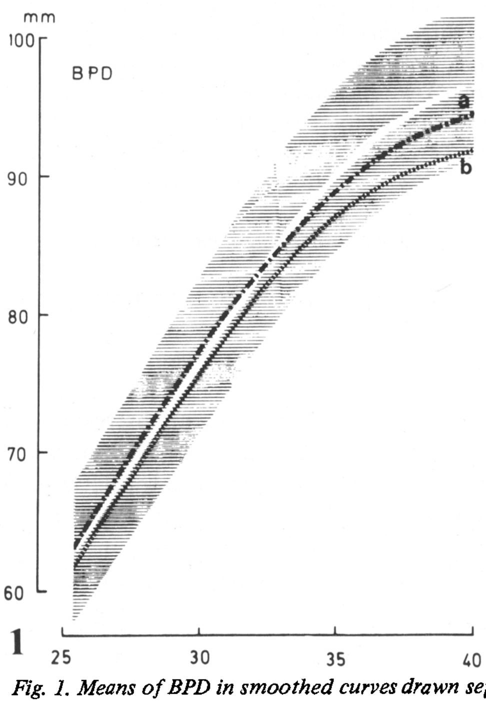
by ultrasonic BPD measurements at regular intervals. Separate BPD growth curves were calculated for the first and the second twin in 119 twin pregnancies examined at least twice during the gestation. The first twin was defined as the one in, or closest to, the pelvic inlet at the time of each examination, irrespective of its position and presentation. Longitudinal BPD growth curves for the first and the second twin were also obtained from 91 twin pregnancies where zygosity was determined. Among the same-sexed twins, zygosity was determined in two ways. Twins found to be monochorionic by histological examination of the placenta, were classified as monozygotic (MZ), as the occurrence of opposite-sexed twins in a monochorionic sack has never been demonstrated [13]. Dichorionic same-sexed twins were tested for blood groups. The following antigens were used: anti-A,-a1, -B, -M, -N, -C, -c, -D, -E, -e, -K, and -Fy^a. All comparisons were performed with the reference BPD growth curve for singletons, which was constructed at the laboratory. BPD measurements were performed by a B-mode compound scanner (sound velocity: 1,540 msec) according to the method of Campbell [1].

A total of 80% of the women were admitted to hospital for the prevention of preterm delivery by bedrest (average 55 days) [11]. The distribution of the duration of pregnancy was similar in the MZ and the dizygotic (DZ) groups. MZ and DZ pregnancies were similarly distributed among hospitalized and nonhospitalized groups. Infants' weight and length and placental weight were measured immediately after birth. A transfusion syndrome was clinically suspected when one twin was recognized as anaemic and the other as plethoric. The diagnosis was confirmed if the twins were monochorionic and if the haemoglobin concentrations differed by more than 50 g/litre between the cotwins in the immediate neonatal period [11].

RESULTS

Figure 1 shows smoothed curves of the BPD growth for the first and the second twin. From the 119 twin pairs, 978 BPD measurements were obtained (average 4.6 readings for each twin).



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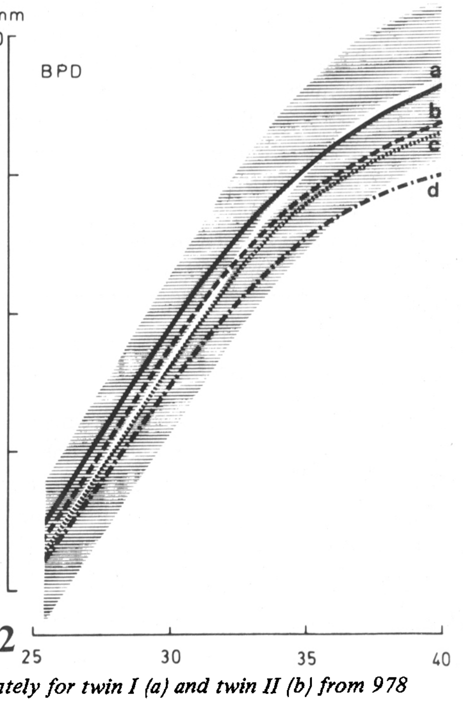

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Fig. 1. Means of BPD in smoothed curves drawn separately for twin I (a) and twin II (b) from 978 longitudinal measurements in 119 twin pregnancies. Shaded area depicts 95% confidence interval of the normal range curve for singletons.

Fig. 2. Means of BPD in smoothed curves drawn separately for dizygotic first (a) and second (b) twins and monozygotic first (c) and second (d) twins from 678 longitudinal measurements in 91 twin pregnancies. Shaded area depicts 95% confidence interval of the normal range curve for singletons.

The mean BPD-values of twin I were very close to those of singletons in the second trimester. From the 32nd week on, the weekly BPD increment of twin I decreased more markedly than that of singletons ($P < 0.05$). The BPD growth curve for the second twin ran consistently below that of the first twin from the 32nd week ($P < 0.05$). The difference between the BPD growth curves of the first and the second twin increased with increasing gestational age ($P < 0.002$). In 74% of the paired readings, the first twin had the larger BPD; in 9%, the measurements were equal. Analysis of the separate growth curves of twin I and twin II for each pregnancy revealed that in 71.4% the curves never crossed. In 20 cases out of 34 where the curves crossed, they did so only once and before week 30.

There was no correlation between the BPD difference between twins and the subsequent difference in body length ($r = -0.09$), head circumference ($r = 0.08$), or birth weight ($r = 0.02$). In seven out of eight cases where the second twin was more than 500 g heavier than the first, the first had the larger BPD.

The average birth weight of twin I (2540 g) and twin II (2470 g) did not differ.

A total of 678 BPD measurements were obtained from the 91 twin pairs whose zygosity was determined. Figure 2 gives in smoothed curves the means of the BPD for the individual measurements in relation to menstrual age separately for MZ and DZ twins, divided into first and second twins. The difference between the first and the second twin remained when curves were drawn separately for DZ and MZ twins ($P < 0.001$).

Mean birth weight for DZ twins was 2532 g and for MZ twins 2433 g (ns). The intrapair weight difference was greater in DZ (mean 332.4 g, SD 225.7) than in MZ twins (mean 242.0 g, SD 154.6 g) ($P < 0.05$). DZ twins had a mean length intrapair difference of 15.6 mm (SD 13.5) and MZ twins of 10.8 mm (SD 9.7) ($P = 0.07$). The total placental weight of DZ twin pairs (mean 949.0 g, SD 169,7) was higher than that of MZ pairs (mean 878.1 g, SD 169.6) ($P = 0.05$). The ratio, total litter weight to placental weight, did not differ between the groups.

Five of the 45 MZ monochorionic pairs had a clinical diagnosis of transfusion syndrome. The table gives the weight, Hb, and BPD differences (at the last examination).

DISCUSSION

A prerequisite for the proper evaluation of the results presented in this paper is the correct identification of the single twin fetuses. Twin I was defined as the one closer to the pelvic inlet at the time of each examination. It is inevitable that twins change places in the pelvic inlet, at least early in gestation. In our experience, the positions of the twins were easily obtained, and they rarely changed after the 24th week. The chance that the particular twin is correctly identified at each examination is estimated at approximately 88% [4]. Any significant difference between the BPDs would be smoothed out if twins changed places at random. Also, the fact that the BPD curves rarely crossed each other, and when they did, it happened rather early in pregnancy, argues in favour of the possibility of a proper identification.

In 74% of the measurements, the twin closer to the pelvic inlet was the one with the largest BPD. Even in pairs with a large weight difference in favour of the second twin, the first had the larger BPD in the expected frequency of 80%. This difference in BPD growth between first and second twin is not readily explained. Other differences between first and second twin have also been reported: cord blood cortisol values [3], lecithin/sphingomyelin ratios of tracheal fluid [14], fetal breathing movements [8]. These findings

TABLE. Weight, Hb, and BPD Differences for Five Twin Pairs With a Clinical Diagnosis of Transfusion Syndrome

Weight twin I/twin II (g)	Hb twin I/twin II (g/litre)	BPD difference twin I/twin II (mm)
2,600[a]/2,310	124/238	−2
3,000[a]/3,120	119/170	+2
2,050[a]/2,390	116/217	+1
2,860/3,040[a]	200/134	+4
1,750[a]/2,020	122/248	+10

[a]Donor-twin according to Hb.

indicate intrauterine biological differences between the first and the second twin. But neither report decides whether the observed difference determines, or is a consequence of, the order of the twins. In the last trimester, the growth of twins, judged by both intrauterine BPD measurements and by weight at delivery, is slowed down compared with that of singletons. This pattern is the same for MZ and DZ twins. The BPD values, consistently larger in DZ than in MZ twins, were not due to differences in maternal age, parity, or complications during pregnancy, or to the presentation of the twins. The finding of a smaller intrapair birth weight difference in MZ than in DZ cotwins disagrees with other observations [2, 5, 10]. One possible explanation lies in the difference in treatment of the twin pregnancies, which in the present study were detected early, treated with bed rest for a considerable part of the gestation, and induced before week 40. It is tempting to speculate that this regime might decrease the influence of nutritive inbalance caused by intertwin transfusion in MZ monochorionic pregnancies, thereby revealing the true genetic similarity between MZ cotwins. A significant intertwin transfusion is expected to create a difference between the twins and thus modify the effects of monozygosity, which, by nature of the genetic identity between the cotwins, would tend to promote similarity in growth.

REFERENCES

1. Campbell S (1968): An improved method of fetal cephalometry by ultrasound. J Obstet Gynaecol Br Commonw 75:568.
2. Daw E (1975): Biological aspects of twin pregnancy in Dundee. Br J Obstet Gynecol 82:29.
3. Gennser G, Ohrlander S, Eneroth P (1977): Fetal cortisol and the initiation of labour in the human. The Fetus and Birth, Ciba Foundation Symposium 47:401.
4. Grennert L, Persson PH, Gennser G, Gullberg B (1979): Zygocity and intrauterine BPD growth of twins. (in preparation).
5. Gruenwald P (1970): Environmental influences on twins apparent at birth. A preliminary study. Biol Neonate 15:79.
6. Göttlicher S, Modjaric J, Krone HA (1977): Der biparietale Dürchmesser des fetalen Kopfes bei Zwillingen und Einlingen im Verlauf der Schwangerschaft. Eine vergleichende Studie. Geburshilfe Frauen-heilkd 37:762.
7. Lubchenco LO, Hansman C, Dressler M, Boyd E (1963): Intrauterine growth as estimated from liveborn birth weight data at 24 to 42 weeks of gestation. Pediatrics 32:793.
8. Maršál K, Gennser G, Kullander S (1978): Breathing movements and fetal presentation. Obstet Gynecol 51:162.
9. McKeown T, Record RG (1952): Observations on fetal growth in multiple pregnancy in man. J Endocrinol 8:386.

10. Naeye RL, Benirschke K, Hagstrom JWC, Marcus CC (1966): Intrauterine growth of twins as estimated from liveborn birth weight data. Pediatrics 37:409.
11. Rausen AR, Seki M, Strauss L (1965): Twin transfusion syndrome. J Pediatr 66:613.
12. Schlensker K-H, Tan HS (1974): Zur Aussagefähigkeit der Ultraschalluntersuchung bei Zwillingschwangerschaft. Perinat Med 5:98.
13. Walker NF (1957): Determination of the zygocity of twins. Acta Genet 7:33.
14. Weller PH, Jenkins PA, Gupta J, Baum JD (1976): Pharyngeal lecithin/sphingomyelin ratios in newborn infants. Lancet 1:12.