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Ultrasound Examination in Twin Pregnancy and Late Fetal Death

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Abstract. *Objective.* To test the hypothesis that the (case) twin later to succumb *in utero* has biparietal diameter measurements (by ultrasound) different from those (control) twins surviving the perinatal period.

Material and methods. Information from the Medical Birth Registry, National Board of Health and Welfare, Stockholm, was used to identify all births in a defined population in southern Sweden with about 20,000 deliveries each year. In 3,019 twin pregnancies between 1973 and 1989, one or both twins were stillborn in 47 cases (gestational duration ≥28 weeks, birthweight ≥500g.). For each case pregnancy, two control pregnancies were selected, the matching criteria being: same delivery unit, same parity (0, I, II, III+), similar year of delivery (± 1 year) and maternal age (± 5 years). Data on ultrasound examinations were extracted from the original medical records. Screening in early second trimester started at one of the units as early as 1973 and at the latest of 12 units in 1982.

Results. There was no obvious difference between cases and controls in intra-pair discordant biparietal diameter (BPD) measured in early second trimester. Nor was there any evident difference in the rate of deviant BPD between cases and controls. In all, 8% of dead male and 24% of dead female fetuses were by definition small-for-gestational age (<-2 standard deviations).

Conclusions. No significant difference was seen between cases and controls regarding deviating biparietal diameters. Abdominal diameter may be a better predictor of subsequent fetal death (not analysed in this study), though only about 15% of all dead twins were deemed small-for-gestational age.

Key words: BPD, Late fetal death, Twins, Ultrasound

INTRODUCTION

Perinatal mortality in twin pregnancy is 4-6 fold higher than in singleton pregnancy [8]. About half of these dead twins are stillbirths [11]. Twin fetuses with differing growth

patterns constitute a high-risk group among twin pregnancies. Such a difference may be a sign of intra-uterine growth retardation (IUGR) in one twin and may indicate neonatal and infant jeopardy [2, 12].

With the introduction of obstetric ultrasound into obstetrics, the possibility of monitoring fetal growth and development has made a quantum leap. Attempts have previously been made to ascertain correlations between fetometric ultrasound measurements and fetal morbidity/mortality in twin pregnancy [6, 7]. However, in many papers the results have been based on a few cases only and the materials are rarely population based [9].

The aim of this population based study was to assess the value of ultrasound from 17 weeks' gestation onwards in order to identify twin pregnancies which may subsequently terminate in stillbirth. Does the twin later to succumb *in utero* have biparietal diameter measurements different from those twins surviving the perinatal period?

MATERIALS AND METHODS

The Medical Birth Registry (MBR) of the National Board of Health and Welfare, Stockholm, has stored information on pregnancies, deliveries, and newborns in Sweden since 1973. The MBR includes all women giving birth from 28 completed weeks of gestation – or earlier if the newborn shows signs of life. By using information in the MBR, we could identify all pregnancies (cases) with one or both twins dead in utero in a defined geographical region in southern Sweden between 1973 and 1989. The region in question has two university hospitals, six central hospitals and four district hospitals. The total number of deliveries each year amounts to about 20,000. The number of twin deliveries during the study period was 3,019.

Compared with the official statistics (Statistics Sweden) 2-3% of all twin records are missing from the MBR [13]. Of the 55 twin pregnancies with one or both twins dead, 47 had reliable information in the original medical records, and a birthweight of both twins ≥ 500 g. To match each pregnancy (case) with one or both twins dead in utero, two control pregnancies with both twins surviving the perinatal period were selected. Matching criteria were: same delivery unit and parity (0, I, II, III+), a similar year of delivery (± 1 year) and fairly similar maternal age (± 5 year). We excluded gestational duration as a matching criterion: the number of eligible controls would most probably have been insufficient.

From the original medical records, information was extracted on birthweight, gestational duration and sex. Estimation of gestational duration was based on ultrasound estimation of the biparietal diameter (BPD) of the larger twin in the pair from an examination performed not later than 22 completed gestational weeks ($<23+0$ weeks). This corresponds to a BPD of 55 mm [10]. If the examination was performed later in pregnancy or not at all, the first day of the last menstrual period was used, and combined with information from the clinical examination in the first trimester. Screening of all pregnancies early in the second trimester has been the general rule, though varying sligthly in individual units, since 1973 in Malmö, and since 1982 in Växjö, with the other units starting in the interim. In most units in the southern region it has been the rule to examine twin-pregnant women repeatedly, every second or third week from 24-26 weeks of gestation. All examinations, including the screening procedure, have been performed by spe-

cially trained midwives or specialists in obstetrics and gynecology. The examinations have been part of a routine schedule offered to all pregnant women and not because of any prospective scientific evaluation.

The gestational duration in the present study was calculated from the BPD and using the formula previously published by Persson et al. in 1986 [10]. The BPD was measured from the outer to the inner contour of the skull, as previously described by Campbell [5]. If the twins differed in size at the time of the screening, calculations were based on information from the BPD of the larger twin. As the control pregnancies had a gestational duration of 3-4 weeks longer than the case pregnancies, we had to use the previously published birthweight-for-gestation standard, based on Swedish twins [14].

RESULTS

All individual measurements of BPD, data available for 18 cases and 46 controls, were plotted against gestational age for those pregnancies diagnosed before 23 weeks' gestation (BPD ≤ 55 mm, Fig. 1). No obvious difference between cases and controls was

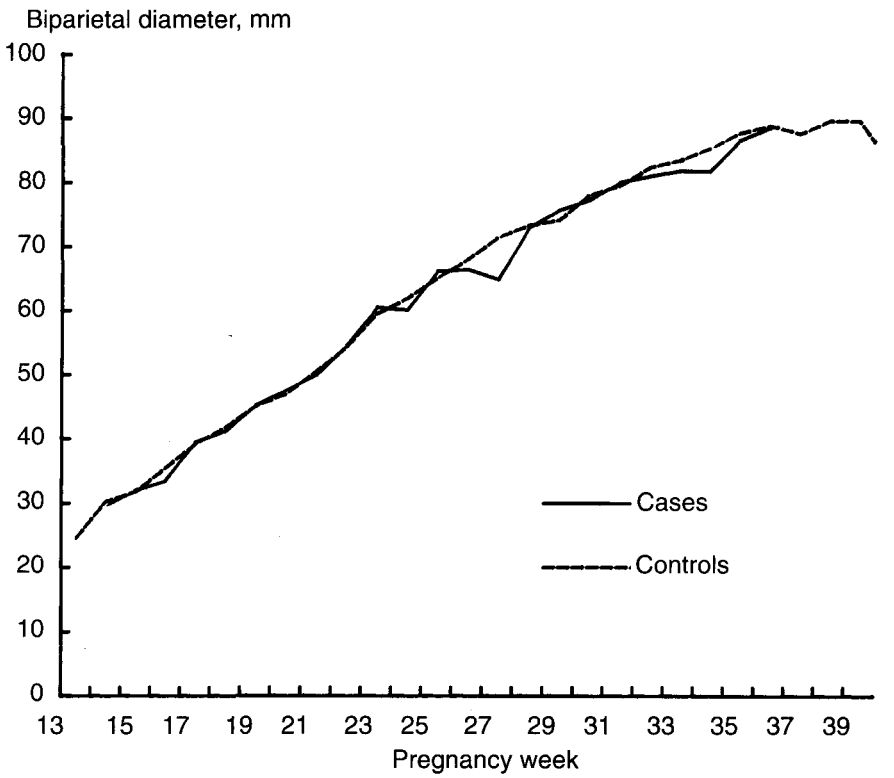

Fig. 1 - Mean BPD for cases and controls. Only twin pregnancies diagnosed before 23 week's gestation included. Moving average.

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evident. Because of the small number of twins in each week we refrained from calculating the standard deviation or standard error of the mean (SEM). The curves calculaled for cases and controls overlap to a considerable extent. Even if the analysis is restricted to the smaller twin in the pair, there is no obvious difference in BPD between cases and controls (Fig. 2). By weeks 26-30 there is a tendency for the case twins to have a somewhat smaller mean BPD (3-4 mm) than the controls. However, the BPD range both for cases and for controls is about 15 mm in these gestational weeks (data not shown).

In the present study including all twin deliveries ending in stillbirth in 12 units during 18 years, information on BPD before 23 weeks' gestation was available for 18/47 of the cases and for 46/94 controls, a statistically insignificant difference ($\chi 2 = 0.7$, $p > 0.05$). However, only 14 cases had one or both controls with information on BPD. The great majority of pregnancies with missing information derive from the early period when ultrasound examinations were not performed. The difference in BPD between the twins in each pair at the time of screening was calculated (Table 1). Althogether, 86% of cases and 96% of controls had a difference not exceeding 3 mm (Fisher's exact test = 0.3, $p > 0.05$).

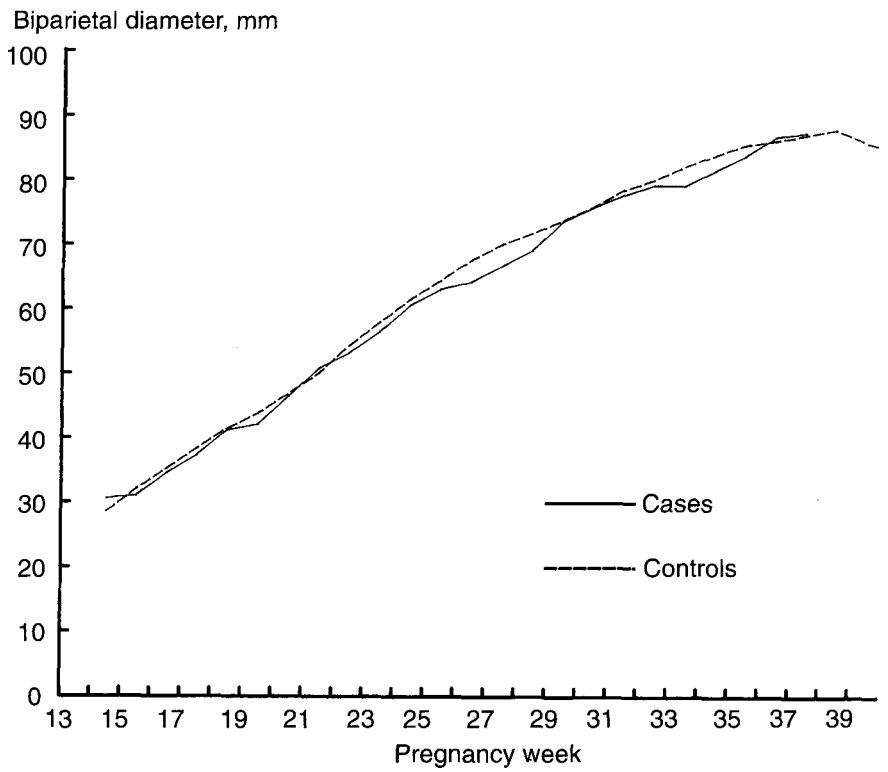

Fig. 2 - Mean BPD for the smaller case and control twins. Only twin pregnancies diagnosed before 23 week's gestation included. Moving average.

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The birthweights of all dead male twins were plotted together wilh the birthweight-for-gestation standard for Swedish twins (Fig. 3). Of all 38 dead male twins, only 3 (8%) were by definition growth retarded. However, only 7 (18%) male cases had a

Table 1 - Difference in biparietal diameter (BPD) at ultrasound examination in second trimester (before 23 weeks' gestation)

Discordance (mm)	Cases *n* (%)	Controls n (%)
0-1	9 (57)	16 (67)
2-3	4 (29)	7 (29)
4-	2 (14)	1 (4)
Total	14 (100)	24 (100)

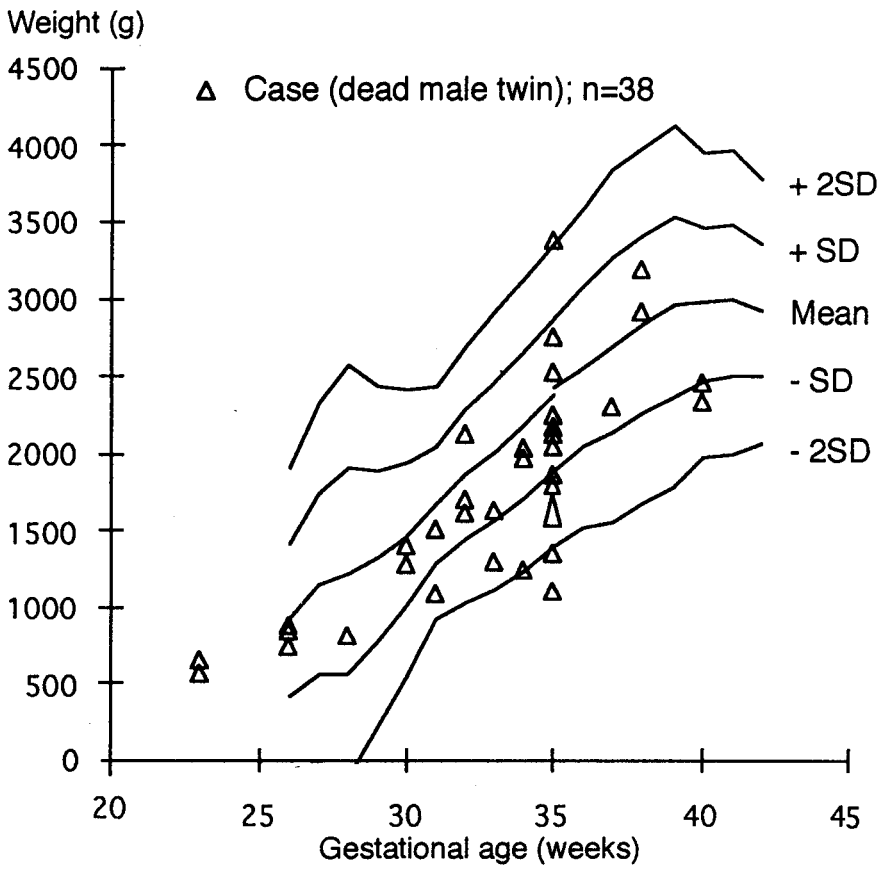

Fig. 3 - Birthweight of all dead male twins. Birthweight-for-gestation as previously published (14). *m*±1SD and ±2SD.

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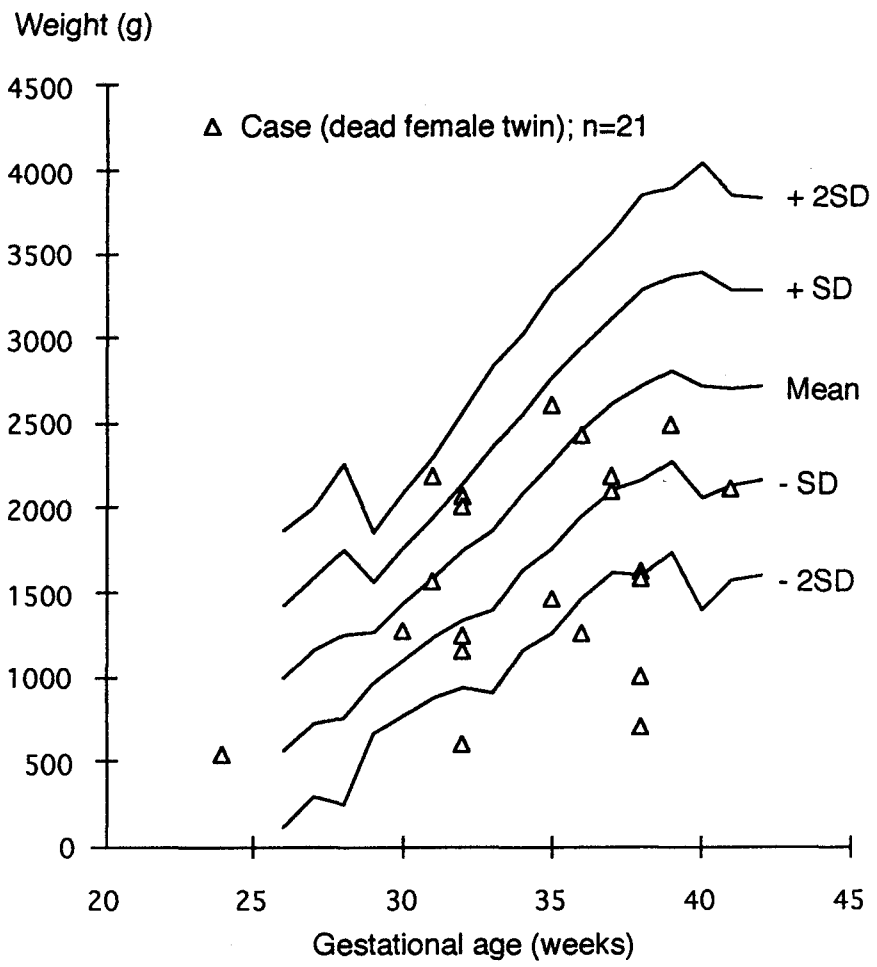

Fig. 4 - Birthweight of all dead female twins. Birthweight-for-gestation as previously published (14). *m*±1SD and ±2SD.

birthweight exceeding the mean (50% expected). For 21 dead females, 5 (24%) were by definition growth retarded, whereas 4 (19%) had a birthweight exceeding the mean (Fig. 4).

Of the 47 case pregnancies, only 5 were unlike-sexed. In 17 like-sexed case pregnancies, both twins were female (in 2 pregnancies both twins were dead). In 25 like-sexed case pregnancies both twins were male (in 10 of these, both twins were dead). Thus it is remarkable that of the 47 case pregnancies, only 5 were unlike-sexed and in none of these were both twins dead (Table 2). In the 30 like-sexed pregnancies with one fetal death the dead twin in the pair was the larger in 5 pregnancies and the smaller in 25 pregnancies (Table 3).

Table 2 - Sex distribution of dead twins

	Like-sexed n = 42	Unlike-sexed (n = 5)
One twin dead		
femal	15	2
male	15	3
Both twins dead		
female	4 (2 pregnancies)	0
male	20 (10 pregnancies)	0

Table 3 - Like-sexed pregnancies with one fetal death in the pair

	Made dead *n* (%)	Female dead *n* (%)	Total *n* (%)
Larger twin dead	3 (20)	2 (13)	5 (17)
Smaller twin dead	12 (80)	13 (87)	25 (83)
Total	15 (100)	15 (100)	30 (100)

DISCUSSION

Case twins and control twins were similar as regards distribution of difference in BPD between the twins in each pair at screening in the second trimester. This still applies even when pregnancies with both twins dying before birth are excluded. Also when the patterns of BPD growth during early pregnancy are compared in cases vs controls it is evident that there is no significant difference. Thus, even when BPD is measured repeatedly during twin pregnancy, one cannot identify those fetuses that will subsequently succumb in utero. However, we cannot be certain that a number of growth-retarded twins might actually have been identified and adequately taken care of.

In most west European countries, ultrasound examination of all pregnant women is performed routinly in the second trimester. When a pregnancy, considered to be at increased risk of complication, is identified, ultrasound examinations are performed repeatedly. In twin pregnancies the purpose of these examinations is to identify deviations from normal development in one or both twins. In particular, deviations from normal growth are considered of great importance, as they may be indicative of the twin-twin transfusion syndrome [4].

In the present case-control study we concentrated on ultrasound findings and birthweights recorded in twin fetuses ultimately to succumb in utero – either one or both. By using information from 12 obstetrical departments in a defined region in southern Sweden the investigation can be regarded as population based. The study covered the first 17

years during which ultrasound examination was in clinical obstetrical use. As the screening procedure was introduced in the different units at different times, BPD data were available for fewer than half of the pregnancies analysed. Abdominal diameter (or girth) and femur length were introduced as routine measures later in the study period and the number of measurements made was therefore too few to allow any valid conclusions. Accordingly, they were excluded from the final analysis.

We are aware of the fact that knowledge of abdominal diameter and weight estimations might have been of value when assessing the prognosis. This knowledge may also have influenced treatment during pregnancy and delivery. On the other hand, when the birthweights of dead twins were plotted on a birthweight for-gestation curve for twins an unexpected pattern emerged. Even though there is a tendency toward a lower individual birthweight for dead twins, the great majority were not per definition growth retarded, i.e. < -2 standard deviation below the mean.

Our study confirms the results of previous investigations that increased perinatal mortality is particularly evident for like-sexed twin fetuses. The reason for this difference between like-sexed and unlike-sexed pairs is with all probability due to the twin-twin transfusion syndrome. Why like-sexed pairs (with a monochorionic placentation) suffer a higher rate of pregnancy loss has been the subject of hundreds of papers during recent decades [4]. A smaller twin, the "donor", via placental anastomoses transfuses its larger, "recipient" twin. Vascular anastomoses, almost invariably present in monochorionic placentas, may be superficial, deep, or a combination of these [3]. In the deep anastomoses, an artery may gain access to and supply a cotyledonary villous structure, ultimately draining it by a vein to the co-twin. This "third circulation", first described by Schatz in 1882, is probably more important in the pathogenesis of twin-twin transfusion syndrome than the superficial type of vascular anastomosis [1]. Regrettably, since Schatz's day, no real progress has been made in our understanding of the etiology of this syndrome [4].

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