

—Originals—

## Characteristics of monochorionic-diamniotic growth-retarded twins during the third trimester

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### Abstract

The goal of this study was to assess the characteristics of monochorionic-diamniotic (MD) growth-retarded twin infants with twin-twin transfusion syndrome (TTTS) compared with those without TTTS during the third trimester. Retrospective analyses of the growth patterns and amniotic fluid volumes were performed on 5 MD twin pregnancies in which one or both twins showed growth retardation with TTTS, and the results were compared with those without TTTS. Eighty-three percent of growth-retarded twin infants without TTTS in MD twin gestation showed an asymmetric growth pattern, while all TTTS cases showed a symmetric pattern ( $p < 0.05$ ). Polyhydramnios of the co-twin was found in 80% of TTTS cases, while no polyhydramnios was found in patients without TTTS ( $p < 0.05$ ). Assessment of growth patterns and amniotic fluid volume may be useful to exclude the possibility of TTTS in MD growth-retarded twin pregnancies during the third trimester. ( J Nippon Med Sch 1999; 66: 300—304)

**Key words:** growth retardation, monochorionic-diamniotic twin pregnancy, twin-twin transfusion syndrome, growth pattern, polyhydramnios

### Introduction

The perinatal mortality rate for monochorionic twin gestation has been reported to be markedly higher than for singletons or dichorionic twins<sup>1</sup>. It is well known that intrauterine growth in twin pregnancies is slower than in singleton pregnancies, especially in the case of monochorionic twins<sup>2,3</sup>. However, the prognosis of monochorionic twin infants complicated by growth retardation has been reported to be influenced by the cause of growth retardation, for example twin-twin transfusion syndrome (TTTS), more than the degree of growth retardation<sup>4</sup>. For example, low-birth-weight twin infants with no complications have been reported to have a lower mortality rate than sin-

gletons of the same birth-weight<sup>5</sup>. Therefore, if a monochorionic growth-retarded twin pregnancy is diagnosed, it should be studied to exclude TTTS. However, the diagnostic criteria for TTTS has not been well established.

Limitations of the maternal supply line and placental crowding have been considered to contribute to the asymmetric growth pattern of twins<sup>2,6</sup>. Smaller twin fetuses with chronic TTTS have been proposed to show symmetric growth patterns during the third trimester, because this condition has been supposed to develop during the second trimester<sup>7</sup>. In addition, polyhydramnios and oligohydramnios have been reported to commonly occur in TTTS cases<sup>8,9</sup>.

Therefore, we hypothesized that assessments of the growth pattern and the amniotic fluid volume are

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useful to exclude TTTS. We assessed here the characteristics of monochorionic-diamniotic (MD) twin pregnancies complicated by growth retardation with TTTS compared to those without TTTS.

### Patients and Methods

We studied the all MD twins complicated by growth retardation that were delivered at 28—41 weeks' gestation at Nippon Medical School and Katsushika Red Cross Maternity Hospital between July 1988 and December 1992. Growth retardation was diagnosed when the birth weight was less than  $-1.5$  SD of the growth curve of twins that we reported previously<sup>10</sup>. Gestational age was established from the maternal menstrual history, and confirmed by ultrasonographic examination of fetal crown-rump length at 9—11 weeks. Chorionicity and amnionicity were diagnosed based on ultrasonic findings and placental pathology. Velamentous cord insertions were also assessed at delivery.

Polyhydramnios was diagnosed when the largest amniotic fluid (AF) pocket was greater than 8.0 cm with no cord in the vertical dimension, while oligohydramnios was diagnosed when the largest AF pocket was less than 2.0 cm<sup>11</sup>. In addition, the head to abdominal circumference (H/A) ratio was calculated in every case at delivery to assess the type of growth pattern as previously reported<sup>12,13</sup>. To establish the normal range, the H/A ratio was calculated for 528 healthy twin infants delivered at 26—42 weeks' gestation.

**Statistical analysis:** The student *t*-test, the  $\chi^2$  test or Fisher's exact test was used when appropriate. Data were presented as mean  $\pm$  SD. *P* < 0.05 was considered statistically significant.

### Results

There were 147 MD twin gestations. Growth retardation was diagnosed in 30 infants (27 twin pregnancies), representing 10% of MD twin infants. Five pairs of twins (19% of MD twin pregnancies compli-

Table 1 Clinical characteristics of patients

	TTTS Group (n=5)	non-TTTS Group (n=25)
Maternal age (y)	27.0 $\pm$ 4.8	29.4 $\pm$ 6.5
Gestational age at delivery (weeks)	33.4 $\pm$ 2.6	34.4 $\pm$ 3.0
Birth weight (SD) #		
growth retarded twin	-3.20 $\pm$ 0.92	-2.98 $\pm$ 0.84
co-twin	+0.40 $\pm$ 1.6	-0.27 $\pm$ 1.5
Birth weight discordance (%)	27.9 $\pm$ 11	26.9 $\pm$ 9.6
H/A ratio (SD) #		
growth-retarded twin	+0.65 $\pm$ 0.40	+2.74 $\pm$ 1.3*
co-twin	-0.26 $\pm$ 0.8	-0.12 $\pm$ 1.1
No. of oligohydramnios		
growth-retarded twin	5 (100%)	10 (40.0%)
co-twin	0 (0.0%)	0 (0.0%)
No. of cases of polyhydramnios		
growth-retarded twin	0 (0.0%)	0 (0.0%)
co-twin	4 (80%)	0 (0.0%)*
No. of cases of velamentous insertion		
growth-retarded twin	2 (40%)	8 (32%)
co-twin	1 (20%)	2 (8.0%)
No. of perinatal mortalities		
growth-retarded twin	3 (60%)	2 (4.0%)*
co-twin	1 (20%)	0 (0.0%)

Data are presented as mean  $\pm$  SD. \* < 0.05 compared with TTTS group.

TTTS = twin-twin transfusion syndrome, H/A = head to abdominal circumference.

# Measurements for birth weights and H/A ratio are expressed as the number of SD by which they differ from appropriate normal means for gestational age.

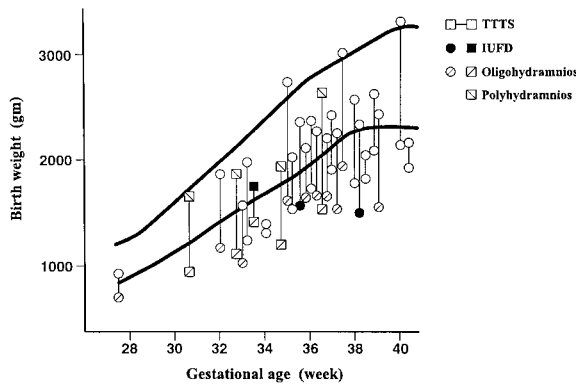


Fig. 1 The birth weights of growth-retarded twins and co-twins in monochorionic gestations plotted on appropriate reference range ( $\pm 1.5$  SD) for twin gestations.

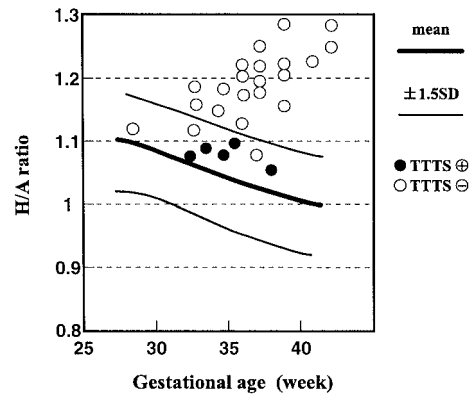


Fig. 2 The head to abdominal circumference (H/A) ratio of monochorionic twins plotted on appropriate reference range ( $\pm 1.5$  SD) for twin gestations.

cated by growth retardation) exhibited chronic TTTS that was diagnosed based on clinical presentation such as cardiomegaly or cardiac dysfunction due to volume loading in the larger twin infant<sup>11</sup> at delivery.

**Table 1** summarizes the clinical descriptions of the patients, and **Fig. 1** shows the birth weight of growth-retarded twin infants and co-twin infants in MD gestations plotted on appropriate reference range ( $\pm 1.5$  SD) for twin gestations<sup>10</sup>. The perinatal mortality in the TTTS group was significantly higher than that without TTTS, as previously described<sup>4</sup>. The average birth weight of the co-twin infants was almost appropriate for the gestational age of twin infants in both groups, and the average birth weight discordance between twins with TTTS was not measurably different from that without TTTS, as shown in **Table 1**. Ten infants without TTTS (40%) were complicated by oligohydramnios, while all infants with TTTS exhibited oligohydramnios. Two infants (40%) that were complicated by TTTS had velamentous insertion of the cord in the placenta, while 8 infants (32%) without TTTS showed this complication (NS).

Polyhydramnios was found in 4 infants (80%) with TTTS, while no infants without TTTS revealed polyhydramnios ( $P < 0.05$ ).

**Fig. 2** shows the H/A ratio of MD growth-retarded twin infants plotted on appropriate reference range ( $\pm 1.5$  SD) for twin gestation. All infants with TTTS were within the symmetric range, while 21 infants (83%) without TTTS were asymmetric ( $P < 0.05$ ).

## Discussion

In singleton pregnancies, the measurements of head to abdominal circumference (H/A) ratio<sup>13,14</sup> and biparietal diameter (BPD) growth rate<sup>15</sup> were reported to be useful to assess the type of growth retardation associated with fetal malnutrition in late pregnancy. However, in twin pregnancies, the measurement of fetal BPD was reported to be technically more difficult<sup>16</sup>. Moreover, racial differences were observed in H/A ratios<sup>17</sup>.

In this study, 83% of growth-retarded MD twin infants without TTTS showed an asymmetric growth pattern based on the approximate reference range of the H/A ratio for twin gestation. In an earlier study<sup>13</sup>, when measurements of newborn twins were compared to those of singleton curves, birth weight and abdominal circumference lagged in the twin infants, while head circumference and body length were comparable to those of singletons. The normal physiologic limitations of the maternal supply line and the placental crowing have been considered to contribute to the asymmetric growth pattern of twins, even in those with weights appropriate for their gestational age<sup>2,6</sup>. Our earlier study<sup>10</sup> and the current results support these studies. Thus, in this study, we used the H/A ratio based on healthy twin infants to determine the usefulness for perinatal diagnosis. The H/A ratio calculated at delivery was similar to that calculated in utero by ultrasonographic examination in our hospital

( $r = 0.87$ ,  $P < 0.05$ , unpublished data).

On the other hand, a symmetric growth pattern was observed in all growth-retarded infants with TTTS. In singleton pregnancies, symmetric growth retardation is generally observed in chronic maternal malnutrition, heavy maternal smoking, fetal infection, and genetic or chromosomal abnormalities<sup>19</sup>. Small twin fetuses with chronic TTTS may show a symmetric growth pattern during the third trimester, since symmetric growth retardation is considered to develop during the second trimester<sup>7</sup>. Recently, in single pregnancies, symmetric retardation was observed in cases complicated by early-onset severe maternal preeclampsia<sup>19</sup>. The mean gestational age of diagnosis for TTTS was reported to be about 22 weeks<sup>20</sup>. Thus, the symmetric growth pattern might be comparable to TTTS. In addition, Leveno et al<sup>21</sup>. reported that a 20% incidence of fetal death is seen with a BPD difference of 7 mm or more between the twins. Williams et al<sup>22</sup>. reported that assessment of the growth pattern is a better marker for perinatal mortality in twins than a 10% degree of growth retardation or a 25% birth weight discordance. Our results support these studies. However, in previous studies, the cause of the growth retardation in twins was not well discussed. This is the first study to show that symmetric growth retardation in twins indicated by the H/A ratio is associated with a high incidence of TTTS and perinatal mortality.

Polyhydramnios and oligohydramnios have been reported to be common in TTTS<sup>8,9</sup>. Stuck twin syndrome has multiple causes, including TTTS, fetal anomalies<sup>23</sup>, and possibly abnormal cord insertion<sup>24</sup>. Velamentous cord insertions have also been reported to be common in TTTS, because the membranously inserted cord can be easily compressed, reducing blood flow to one twin fetus<sup>25</sup>. However, in this study, the incidence of velamentous cord insertion in the TTTS group was not measurably different from that in the group without TTTS. In addition, our results supported the finding that oligohydramnios is also common in malnutritional growth-retarded twin fetuses, because the redistribution of fetal blood flow can contribute to this phenomenon. Thus, we speculated that abnormal cord insertion contributes only to the incidence of growth retardation associated with oligohy-

dramnios, and additional factors affecting the circulatory condition contribute to the incidence of TTTS. On the other hand, polyhydramnios was observed in 80% of TTTS infants and in 0% of infants without TTTS. In the current series, only 1 fetal structural anomaly (congenital heart disease) was observed in twin pregnancies complicated by polyhydramnios. This case was a dichorionic twin pregnancy. Thus, our results indicate that the assessment of polyhydramnios is useful to exclude TTTS.

In conclusion, we performed retrospective analyses on MD twin pregnancies in which one or both twins showed growth retardation with TTTS compared to those without TTTS. We speculated that the assessment of the type of growth retardation and the amniotic fluid volume are useful to exclude TTTS during the third trimester.

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