Fetal Complications in Twin Pregnancies with Special Reference to Chorionicity

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Abstract

Monochorionic twins are at greater risk for growth abnormalities and other fetal complications, which may result in neonatal and long-term morbidity. This study is to evaluate and compare fetal complications in twins in relation to chorionicity. A prospective study was conducted in a tertiary care hospital over a period of one year. Chorionicity was determined antenatally using ultrasound and confirmed postnatally by placental examination. Fetal complications in relation to chorionicity were studied. Among 232 cases of twins studied, 152 were dichorionic diamniotic (65.5%), 74 were monochorionic diamniotic (31.9%) and 6 were monochorionic monoamniotic (2.5%) fetal complications were more among monochorionic twins compared to dichorionic twins. Incidences of congenital malformations, discordant growth, intrarueine growth restriction, twin-twin transfusion syndrome and antepartum fetal demise were all higher with monochorionic twins compared to dichorionic. Fetal complications in monochorionic twins are greater compared to dichorionic. Hence, early diagnosis of chorionicity and prompt intervention is very important in reducing the morbidity and perinatal mortality among twins.

Key Words: Twins, Monochorionic, Dichorionic, Complication

Introduction

Twins and higher order gestations have always attracted interest, in part because of their novelty, but also because of the dramatic increase in risk to both mother and neonate. Currently multiple pregnancies account for 3% of all pregnancies (American College of Obstetricians and Gynecologist [ACOG], 1998), of which 94% are twins. In India, twin pregnancies account for 1% of pregnancies and 10% of perinatal mortality.1,2 The incidence of twinning has been on the rise over the last few decades. This was not only due to the inadvertent use of ovulation induction drugs in assisted reproductive techniques, but also due to the increase in the rate of delayed childbearing. Patients with multiple pregnancies are at increased risk for growth abnormalities and, therefore, increased perinatal morbidity and mortality.3,5 Understanding the fetal chorionicity and its relationship to maternal and fetal complications have significantly reduced the perinatal mortality.

Zygoosity refers to the type of conception and chorionicity refers to placmentation. Monozygotic twinning refers to a gestation derived from a single fertilized zygote. The chorion differentiates on day 4 and amnion on day 8 after fertilization. When cleavage occurs before the 4th day, both chorion and amnion splits completely resulting in each embryo having separate chorion and amnion (dichorionic-diamniotic). When cleavage occurs between 4th and 8th day, chorion has already differentiated resulting in monochorionic diamniotic placenta. When twinning occurs after 8th day, it results in a single placenta and single amniotic cavity (monochorionic monoamniotic) placentation. Dizygotic twin’s results from 2 separately fertilized zygotes.

When compared to dichorionic twins, 15-20% of monochorionic twins have increased the risk of complications due to the imbalance in placental sharing between fetuses. The serious complications encountered are growth discordance, twin-twin transfusion syndrome (TTTS), the single fetal demise (SFD) and fetal brain injury to the surviving twin. These complications commence to develop between 17th and 26th week of gestation. Diagnosis of chorionicity, ideally done before 14 weeks of gestation is crucial for a proper and vigilant screening for complications, especially in monochorionic twins.6

Materials and Methods

This was a clinical, non-interventional prospective study conducted in a tertiary care hospital over a period of one year. There were a total of 15310 deliveries during the study period, of which there were 252 cases of twin pregnancies. 232 cases of twin pregnancies admitted to the hospital and delivered in the hospital were enrolled in the study. Detailed history, clinical examination and analysis of investigations were done with a view to determine maternal and fetal complications, with special reference to chorionicity. These patients were followed up till delivery. Diagnosis of chorionicity was made by trans-abdominal ultrasound taken in the first or second trimesters and confirmed by examination of placenta postnatally. Higher

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order multiples were excluded from the study. Chorionicity was classified as dichorionic diamniotic (DCDA), monochorionic dichorionic (MCDA) and monochorionic monoamniotic (MCMA). Fetal complications, which were compared between monochorionic and dichorionic twins included congenital abnormalities, growth abnormalities such as discordant growth, intrauterine growth restriction (IUGR), TTTS and antepartum fetal demise.

Operational Definitions

1. IUGR is defined as the estimated fetal weight less than the 10th centile for the gestational age.
2. Significant growth discordance was diagnosed if the interpair difference in the estimated fetal weight was more than or equal to 20%.
3. TTTS was diagnosed by the recognition of a single placenta, same gender fetuses, significant weight discordance, and significant amniotic fluid discordance, often with a stuck twin.
4. Intrauterine death (IUD) was defined as death of the fetus in utero after 20 weeks.

Statistical methods used to analyze the results were chi-square tests and students test wherever appropriate. P<0.05 was taken as significant.

Consent was obtained from the patients to be included in the study. Institutional Ethical Committee clearance was also obtained.

Results

There were a total of 232 cases of twin deliveries during the study period of 1-year. The prevalence of twins was found to be 1.5%. There were 152 cases of DCDA twins (65.5%), 74 cases of monochorionic diamniotic (31.9%) and 6 cases of MCMA twins (2.5%). The mean gestational age at delivery of monochorionic twins in this study was 33.2 weeks, whereas it was 35.6 weeks for dichorionic twins.

Fetal complications were more with monochorionic twins compared to dichorionic twins (Table 1).

There were 5 cases of congenital malformations among monochorionic twins (6.5%) and 2 cases among dichorionic (1.4%) (Table 2).

Incidence of growth discordance was found to be higher in monochorionic twins (25%) compared to dichorionic twins (11.84%) (Table 3). In this study, a discordance of 20% and more was considered to be significant. The relationship between monochorionicity and growth discordance was found to be statistically significant.

IUGR in monochorionic twins (17.5%) was found to be greater when compared to dichorionic (6.6%) (Table 4). The relationship between IUGR and monochorionicity was found to be statistically significant. Severe IUGR, as indicated by abnormal Doppler, was more in monochorionic (3.9%) when compared to dichorionic.

There were 4 cases of TTTS; all were monochorionic twins, incidence being 5.2%.

There were 12 cases of SFD among monochorionic twins (15.6%) compared to 5 cases among dichorionic (3.5%) (Table 5).

Among monochorionic twins, 3 cases went for both IUD and in dichorionic there were 2 cases of both twin IUD. Increased

### Table 1. Distribution of fetal complication according to chorionicity

<table>
<thead>
<tr>
<th>Fetal complications</th>
<th>Monochorionic</th>
<th>Dichorionic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital anomalies</td>
<td>5 (5.7)</td>
<td>2 (1.3)</td>
</tr>
<tr>
<td>IUGR</td>
<td>14 (15.9)</td>
<td>10 (6.6)</td>
</tr>
<tr>
<td>Discordance</td>
<td>20 (22.7)</td>
<td>18 (11.8)</td>
</tr>
<tr>
<td>TTTS</td>
<td>4 (4.5)</td>
<td>0</td>
</tr>
<tr>
<td>Single fetal demise</td>
<td>12 (13.6)</td>
<td>5 (3.3)</td>
</tr>
<tr>
<td>Both IUD</td>
<td>3 (3.4)</td>
<td>2 (1.3)</td>
</tr>
<tr>
<td>Vanishing twin</td>
<td>-</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td>Fetus papyraceus</td>
<td>1 (1.3)</td>
<td>3 (2.1)</td>
</tr>
<tr>
<td>Abnormal doppler</td>
<td>3 (3.9)</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td>Cord entanglement</td>
<td>2 (2.6)</td>
<td>-</td>
</tr>
</tbody>
</table>

IUGR: Intrauterine growth restriction, TTTS: Twin-twin transfusion syndrome, IUD: Intrauterine death

### Table 2. Details of major congenital malformations

<table>
<thead>
<tr>
<th>Anomalies</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klippel-Trenaunay syndrome</td>
<td>1</td>
</tr>
<tr>
<td>Renal agenesis</td>
<td>1</td>
</tr>
<tr>
<td>Diaphragmatic hernia</td>
<td>1</td>
</tr>
<tr>
<td>Holoprosencephaly</td>
<td>1</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 3. Discordance and chorionicity

<table>
<thead>
<tr>
<th>Discordance</th>
<th>Monochorionic</th>
<th>Dichorionic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>20 (25)</td>
<td>18 (11.8)</td>
<td>38</td>
</tr>
<tr>
<td>Absent</td>
<td>60 (75)</td>
<td>134 (88.1)</td>
<td>194</td>
</tr>
<tr>
<td>Total</td>
<td>80 (100.0)</td>
<td>152 (100.0)</td>
<td>232</td>
</tr>
</tbody>
</table>

Chi-square=6.6252, P=0.01005374

### Table 4. IUGR and chorionicity

<table>
<thead>
<tr>
<th>IUGR</th>
<th>Monochorionic</th>
<th>Dichorionic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>14 (17.5)</td>
<td>10 (6.6)</td>
<td>24</td>
</tr>
<tr>
<td>Absent</td>
<td>66 (82.5)</td>
<td>142 (93.4)</td>
<td>208</td>
</tr>
<tr>
<td>Total</td>
<td>80 (100.0)</td>
<td>152 (100.0)</td>
<td>232</td>
</tr>
</tbody>
</table>

IUGR: Intrauterine growth restriction. Chi-square=6.74025, P=0.00942619
incidence of both IUDs in monochorionic twins may occur following SFD.

There was only one case of vanishing twin, which was sonologically diagnosed to be dichorionic. There was one case of fetus papyraceus in the monochorionic group (1.3%) and 4 in the dichorionic group (2.1%).

**Discussion**

The prevalence of twin pregnancies in our study was 1.5%, 65.5% was dichorionic diamniotic, 31.9% was monochorionic diamniotic, and 2.5% monochorionic monoamniotic. Our incidence of monochorionic twins is within the expected incidence of 20-30%.7,8

Twin pregnancies, in comparison to singleton pregnancies, are associated with an increased incidence of congenital anomalies. There were 5 cases of congenital anomalies among monochorionic twins and 2 cases among dichorionic. The incidence of congenital anomalies was higher for monochorionic (6.5%) compared to dichorionic (1.4%). Studies by Neilson showed that increased incidence of malformations was confined to monochorionic twins and that the incidence in dichorionic was similar to singleton pregnancy. Domingues et al, in her studies, got an equal rate of congenital malformation among both types of twins (3.7%). Uchida et al found a 17% incidence of anomalies in twin abortuses and that malformations tend to be higher in like sexed twins compared to unlike sexed.9

In our study, monochorionic twins were associated with major anomalies like Klippel–Trenaunay syndrome, diaphragmatic hernia, cardiomyopathy, central nervous system malformations and renal agenesis, when only minor anomalies like calcaneovalgus deformity and cleft lip were noticed among dichorionic twins (Table 2). Review of literature by Bahtiyar et al has noted that congenital heart disease was significantly prevalent among monochorionic diamniotic twins than the general population. Ventricular septal defect being the most common.10

IUGR is defined as the estimated fetal weight less than the 10th centile for gestational age. Growth restriction in monozygotic twins may be due to inequality in the allocation of blastomeres, vascular anastomosis within the placenta and discordant structural anomalies. In Dizygotic pregnancies, this may result from unequal placentation and different genetic growth potentials. In our study, intrauterine growth retardation in monochorionic twins (17.5%) was higher in comparison to dichorionic (6.6%) (Table 4). Chauhan et al in his studies has reported the prevalence of IUGR to be 26% among dichorionic twins and as high as 46% in monochorionic twins.11 Similar incidence was found in studies conducted by Domingues et al where IUGR was reported in 20.4% of monochorionic and 9.3% of dichorionic.7 In the study by R. Radhakrishnan, IUGR was identified in 21.3% of monochorionic and 12.9% of dichorionic twins.12 Studies have shown that the degree of growth restriction in monochorionic is likely to be greater than in dichorionic. This may be due to the increased risk of TTTS in monochorionic.13

In utero growth discordance is defined as the difference in ultrasound estimated fetal weights which are expressed as a percentage of the larger twin's estimated fetal weight. Abnormal growth discordance has been defined as ranging from 15% to 40%, but generally thought to be more than 20%. ACOG considers a 15-25% difference in actual weight among twins to be discordant.14 Monochorionic twins are at higher risk for discordance due to unequal sharing of placenta, placental cord abnormalities and TTTS.15 In our study, discordance was more among monochorionic pregnancies (25%) compared to dichorionic pregnancies (11.8%) (Table 3). Here the cut off for discordance was taken as more than 20%. Studies by Sebire et al reported growth discordance in 11.3% of monochorionic twins and 12.1% of dichorionic twins when >25% discordance was taken as significant.15 Studies by R. Radhakrishnan identified discordance in 25% of dichorionic pregnancies and 28% of monochorionic pregnancies when 20% discordance was taken as significant.12 Studies by Domingues et al have reported an incidence of 24.1% in monochorionic gestation compared to 12.1% in dichorionic. Growth discordance have been found among 20% of MCDA twins.17 Velamentous cord insertion found among 13-21% of twin pregnancies is more frequent among monochorionic twins and found to be associated with both growth discordance and >50% risk for TTTS.18,19

TTTS occurs due to an imbalance in the blood flow through the communicating vessels across a shared placenta, which leads to underperfusion of the donor twin and overperfusion of the recipient. Most often the donor twin develops IUGR and oligamnios and the recipient develops volume overload and polyhydramnios.20 The early onset of the syndrome is associated with poor prognosis and if left untreated, resulted in 60-100% mortality for both twins.21,22 Even though all monochorionic twins have vascular sharing, only about 15% develop TTTS.23 There were 4 cases of TTTS in our study. All were monochorionic with an incidence of 5.2%. The mean gestational age at diagnosis was 25.4 weeks and resulted in 3 fetal deaths. Studies by Domingues et al reported an incidence of 7.4% in monochorionic twin gestation with a mean gestational age at diagnosis of 24.4 weeks. Studies by

### Table 5. Single fetal demise and chorionicity

<table>
<thead>
<tr>
<th>Single fetal demise</th>
<th>Monochorionic</th>
<th>Dichorionic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>12 (15.0)</td>
<td>5 (3.3)</td>
<td>17</td>
</tr>
<tr>
<td>Absent</td>
<td>68 (85.0)</td>
<td>147 (96.7)</td>
<td>215</td>
</tr>
<tr>
<td>Total</td>
<td>80 (100.0)</td>
<td>152 (100.0)</td>
<td>232</td>
</tr>
</tbody>
</table>

Chi-square = 10.58491, P = 0.00114015
Bermúdez et al have showed that monochorionic twin gestation is associated with 10-15% risk of TTTS. Monoamniotic gestation was also found to be associated with 6% incidence of TTTS according to Hack.

SFD complicates 0.5-6.5% of all twin gestations. In our study, the incidence was found to be 7.3% Enbom suggested an incidence between 0.5% and 6.8%. Fetal death in monochorionic gestations is attributed to the high incidence of placental vascular anastomosis and TTTS whereas fetal death in dichorionic gestations has been associated with vascular thrombosis, IUGR, abruption, and preeclampsia. Bernischke has found velamentous cord insertions in 23% of MCDA and 13% of DCDA.

SFD in monochorionic twins (15%) was higher compared to dichorionic (3.3%) in our study. This is comparable to the incidence of fetal death in a study conducted by Dominguez et al where 2.5% of SFD was seen among monochorionic compared to 0.3% in dichorionic. It has been shown in a study conducted by Lee YM et al on a series of 1000 consecutive twin pairs, that risk of IUD is higher in monochorionic (3.6%) compared to dichorionic (1.1%). Studies by D’alton, Newton and Cetrulo showed a higher incidence in monochorionic placentation. Newmann says that incidence of SFD in monochorionic is 3 times greater than in dichorionic. Hannon and hill are of the same view.

In the present study, majority of the cases of SFD was attributed to discordance, TTTS, IUGR and congenital anomalies, 2 cases due to cord entanglement both of which were MCMA and 1 case due to abruption (Table 6). Only one vanishing twin was detected in the study population, which was dichorionic. Landy et al reported a disappearance rate of 21.2%. According to Pharrah and Cooke, the vanishing twins were mainly seen in the ultrasound in the dichorionic placenta, which were devoid of the anastomosis. There was one case of fetus papyraceus in the monochorionic group and 4 in the dichorionic group. The incidence was more among the dichorionic (2.1%) compared to monochorionic (1.3%). Ottolenghi found the incidence of fetus papyraceus to be 1/184 births. Studies have shown that the antepartum death of one of the fetuses may occur in 2.5-5% of twin pregnancies, being associated with significant morbidity and mortality in the surviving co-twin. Enbom’s review of the literature concluded a high incidence of unfavorable outcome among survivors in monochorionic gestations where 46% of survivors suffered death or major morbidity.

In the present study, incidence of both twin IUD was also found to be higher in monochorionic than dichorionic (3.9% vs. 1.4%). In study conducted by Hillman SC et al, cotwin demise was seen in 15% of monochorionic and 5% of dichorionic gestation.

Conclusion

Fetal complications among twins seem to be influenced by the type of placentation, with monochorionic twin pregnancies characterized by a higher incidence of complications like anomalies, growth abnormalities, and antepartum fetal demise. Early and accurate diagnosis of chorionicity by ultrasound will definitely help to identify the twins at risk and early referral to tertiary hospitals possible. In clinical practice, management decisions are related to the presence and severity of complications as each type carries different prognosis and expected morbidity. Prenatal diagnosis in early gestation by ultrasound can alert the obstetrician regarding need for more vigilance during the antenatal period. It can also help in counseling the patient regarding possible adverse perinatal outcome.

End Note

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Conflicts of Interest

None declared.

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