A Case Series of Pre-Viable Severe Twin-Twin Transfusion Syndrome

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Abstract

***Introduction**: We present a case series of pre-viable severe twin-twin transfusion syndrome (TTTS). **Clinical Picture**: In year 2000, there were 16,688 deliveries in KK Women's and Children's Hospital. Four cases that presented before 24 weeks gestation satisfied the sonographic criteria for severe TTTS: same-sex fetuses, absence of twin peak sign, thin intertwin membrane, polyhydramnios associated with large bladder in recipient twin, and oligohydramnios and small or absent bladder in donor twin. **Treatment**: Amnioreduction, septostomy and termination of pregnancy were offered. **Outcome**: In 1 case abortion was chosen. The follow-up was at least 18 months postnatal. There was 1 intrauterine death, 2 with severe neurological handicap and 3 with normal outcome. **Conclusion**: Pre-viable severe TTTS is associated with significant mortality and morbidity rates and should be diagnosed promptly and managed in a tertiary fetal medicine unit with multi-disciplinary input.*

***Ann Acad Med Singapore* 2003; 32:645-8**

Key words: Amnioreduction, Amniotic band, Perinatal outcome, Septostomy

Introduction

Monozygotic twinning has an incidence of approximately 3.5 per 1000 pregnancies.[1] Only 25% of monozygotic twins have a dichorionic placenta. The remaining 75% compete for one monochorionic (MC) placenta.[2] The twin-twin transfusion syndrome (TTTS) complicates up to 20 percent of MC pregnancies.[3] TTTS was previously diagnosed based on neonatal criteria:[4]

- intertwin haemoglobin difference >5 g/100mL,
- pallor in 1 twin and plethora in the other,
- intertwin birth weight difference ≥15%.

Using the above criteria, the outcome of TTTS managed at KK Hospital Women's and Children's (KKH) was reported as 88.9% normal infants, 5.6% of infants with neurological sequelae and 5.6% intrauterine deaths at 2 years.[5] The neonatal criteria for the diagnosis of TTTS are not useful for antenatal management and are not consistent features of TTTS.[6] They have been substituted by antenatal sonographic criteria. Severe TTTS is diagnosed in the presence of the oligohydramnios-polyhydramnios sequence in an MC diamniotic (DA) pregnancy. Later manifestations of the disease include anuria in the donor twin, abnormal Doppler changes in either the donor or recipient, and hydrops in the recipient. Less consistent ultrasound evidence of TTTS includes discordance in fetal size, disparity in the size of the umbilical cords. If left untreated, severe TTTS is associated with a perinatal mortality rate of 60%.[7]

The management options of TTTS include conservative, needle procedures like amnioreduction and septostomy, and more invasive procedures like cord occlusion and Nd:YAG laser ablation of vascular anastomoses. Much controversy still exists with regard to the optimal treatment for TTTS, though there is now evidence to suggest that needle procedures like amnioreduction are appropriate in less severe TTTS, while more invasive procedures like laser ablation of vascular anatomoses may be indicated in more severe TTTS.[8]

We present a case series of severe TTTS, diagnosed before 24 weeks gestation, managed at KKH.

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TABLE I: CHARACTERISTICS, PRESENTATION AND OUTCOMES OF CASES WITH SEVERE TTTS

Variable	Patient 1	Patient 2	Patient 3	Patient 4
Age (y)	27	34	29	27
Gravida (G) /Parity (P)	G1P0	G2P0	G2P1	G1P0
Gestational age at diagnosis	19+6	21+2	20+0	22+0
Presentation	Discordant growth, oligohydramnios (with collapsed bladder)-polyhydramnios sequence, on screening scan	Discordant growth, oligohydramnios (with collapsed bladder)-polyhydramnios sequence on screening scan	Discordant growth, oligo-hydramnios (with collapsed bladder)-polyhydramnios sequence on screening scan	Discordant growth, oligo-hydramnios (with collapsed bladder)-polyhydramnios sequence on screening scan
Therapeutic procedures	Serial amnioreduction x 6 • 20+0 • 21+0 • 22+0 • 23+4 • 24+1 • 25+2 Septostomy	Septostomy • 21+3 Serial amnioreduction x 4 • 21+3 • 21+5 • 25+0 • 26+6	Nil	Amnioreduction x 1 • 22+0 Septostomy
Gestational age at delivery	25+5	27+6	21+5	28+5
Birth weights	Twin 1: 640 g/ Twin 2: macerated stillbirth	Twin 1: 1223 g/ Twin 2: 985 g	Twin 1: 350 g/ Twin 2: 310 g	Twin 1: 768 g/ Twin 2: 1084 g
Diagnosis to delivery interval (weeks + days)	5+6	6+4	1+5	6+5
Indication for delivery	Development of hydrops in 2nd fetus after intrauterine death of 1st twin 3 days before	Twin 2 • All parameters near 3rd centile Umbilical Artery Pulsatility index (UAPI) very high • No end-diastolic flow in the umbilical artery	Parents counselled regarding options. Wants termination of pregnancy.	Twin 1 • Abdominal circumference less than 3rd % • UAPI very high • No end-diastolic flow in the umbilical artery
Mode of delivery	Caesarean section	Caesarean section	Prostaglandin induced mid-trimester abortion	Caesarean section
Neonatal outcome				
Short-term morbidity	• Neonatal intensive care unit (NICU) stay for 187 days • Stage 5 retinopathy of prematurity (ROP) • Chronic lung disease/ Grade 4 hyaline membrane disease (HMD)/persistent pulmonary hypertension • Solitary gastrointestinal perforation requiring laparotomy and ileostomy	• Twin 1: NICU for 35 days and neonatal special care unit (NSCN) for 32 days. Grade 2 HMD • Twin 2: NICU for 37 days and NSCN for 51 days. Grade 1 intraventricular haemorrhage Stage 1 ROP Necrotising enterocolitis	Not applicable	• Twin 1: NICU for 98 days and NSCN for 43 days Stage 2 ROP chronic lung disease Grade 3 HMD cholestatic jaundice Patent ductus arteriosus • Twin 2: NICU for 29 days, NSCN for 41 days. Grade 3 HMD
Intermediate-term morbidity	At 24 months, • Severe neuro-developmental delay • Severe visual handicap	At 18 months, • Both twins have normal neurodevelopment. • Twin 2 has a mild constriction band around the forearm.	Not applicable	At 24 months, • Twin 1: non-ambulant spastic quadriplegia/ cerebral palsy. Severe neuro-developmental delay. • Twin 2: has normal neurodevelopment
Bill size of neonatal and nursery care without subsidy ($S)	$180,000	Twin 1: $45,000 Twin 2: $55,000	Not applicable	Twin 1: $110,000 Twin 2: $43,000

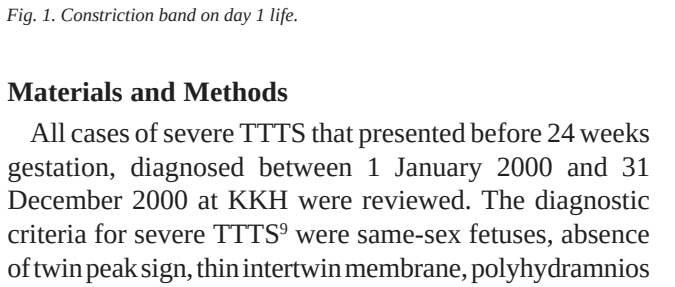

Fig. 1. Constriction band on day 1 life.

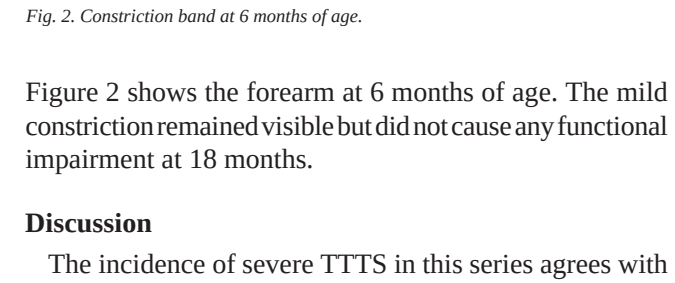

Fig. 2. Constriction band at 6 months of age.

Materials and Methods

All cases of severe TTTS that presented before 24 weeks gestation, diagnosed between 1 January 2000 and 31 December 2000 at KKH were reviewed. The diagnostic criteria for severe TTTS[9] were same-sex fetuses, absence of twin peak sign, thin intertwin membrane, polyhydramnios associated with large bladder in recipient twin, and oligohydramnios and small or absent bladder in donor twin. These patients were managed by the High Risk Perinatal Team and received close surveillance by serial biometry and Doppler studies. The obstetric data was collected by a manual search while the paediatric outcomes were derived from the paediatricians' follow-up. Serial amnioreduction and septostomy were the mainstay of management of severe TTTS during the study period. Severe handicap was defined using Kitchen et al's[10] criteria: Bayley's Mental Developmental Index (MDI) <70 or non-ambulant cerebral palsy or bilateral blindness or deafness requiring hearing aids.

Results

In year 2000, there were 16,688 deliveries in KK Hospital and 4 cases that satisfied the inclusion criteria for severe TTTS. The incidence was 1 in 4000 total births. Severe TTTS was diagnosed at 19.9, 20.0, 21.3 and 22.0 weeks of gestation. After careful counselling by the High Risk Perinatal Team, the parents of 1 pair of twins opted for termination of pregnancy which was performed at 21.7 weeks of gestation. For the remaining 3 pairs of twins, therapeutic procedures like amnioreduction and septostomy were performed. A detailed analysis of the maternal characteristics, gestation at diagnosis and delivery, interventions, mode of delivery and neonatal outcome is outlined in Table I.

A neonate, who had amniocentesis and septostomy performed, had a constriction band around the forearm. Figure 1 shows the anomaly during the first day of life. Figure 2 shows the forearm at 6 months of age. The mild constriction remained visible but did not cause any functional impairment at 18 months.

Discussion

The incidence of severe TTTS in this series agrees with other studies that have documented a 15% incidence of TTTS among MC pregnancies which occur at an incidence of 1 in 400 total births.[11] Of the 6 fetuses that were not aborted, 5 survived (85%) with significant neurological handicap in 2 (40%). This agrees with the results from other series where neonatal survival and subsequent handicap rates for amnioreduction range from 30% to 80% and about 20% to 30%, respectively.[12-14]

Amnioreduction has been shown to reduce intra-amniotic pressure which reduces the abdominal distension and maternal discomfort, and increases the uteroplacental perfusion[15] with the aim to delay premature rupture of membranes and premature labour. The recognised risks of amnioreduction include premature rupture of membranes, premature labour, abruption and infection.[16] None of these complications were reported in this small series. Septostomy may also improve survival rates, and may reduce the number of amnioreductions necessary to relieve polyhydramnios though its mechanism of action is unclear. It risks the conversion of a diamniotic twin pregnancy into a pseudomonoamniotic twin pregnancy with risks of cord entanglement. The constriction ring around the arm noted in one of the neonates is a rare condition with few cases described in the literature. Similar cases in singletons and monozygotic twins had been described after the amniocentesis, chorionic villus sampling and insertion of pleuro-amniotic shunt.[17-20] Septostomy and amniocentesis had been performed in this pregnancy. It remains unclear if this is secondary to the disease process or a complication of the treatment modality[21] though the pathogenesis of such malformations has often been ascribed to amniotic band

disruption complex. This case adds further evidence that such amniotic band syndrome rarely occurs after invasive procedures, and may cause *in utero* death.

Conclusion

Pre-viable severe TTTS is associated with significant mortality and morbidity rates, and should be diagnosed promptly and managed in a tertiary fetal medicine unit with multidisciplinary input.

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