Twin-twin transfusion syndrome: a five year review

Y C Seng, V S Rajadurai

Abstract

Objective—To determine the incidence, complications, management, and outcome in infants with twin-twin transfusion syndrome (TTTS) over a period of five years.

Methods—TTTS was diagnosed in monochorial twins if one was pale and the other plethoric with a haemoglobin difference > 5 g/100 ml and/or birthweight differences > 15%.

Results—Eighteen (6.2%) of the 292 twin pairs had TTTS. Eight pairs (44%) had the acute type and the rest (56%) had the chronic type of TTTS. The mean (SEM) intrapair haemoglobin difference in the acute type was 4.8 (2.1) g/100 ml which gave a discordance of 7.1 (4.6)%, whereas that in the chronic type was 6.9 (2.9) g/100 ml and 24.4 (6.1)%, respectively. Infants with the acute type had a significantly higher incidence of vaginal delivery (p < 0.03), hypotension (p < 0.025), and respiratory distress (p < 0.01) compared with those with the chronic type. There was no significant difference in the incidence of anaemia, polycythaemia, asphyxia, hypoglycaemia, and hyperbilirubinaemia. Two recipients died in utero as the result of chronic TTTS, while their survivors developed spastic cerebral palsy. There were no neonatal deaths.

Conclusions—TTTS, although uncommon, may have an adverse neurodevelopmental outcome especially if one twin dies in utero. Prompt recognition and management of the haemodynamic and haematological problems of infants with the acute types of TTTS will result in optimal neurodevelopmental outcome.

Methods

This is a retrospective review of all the twin pairs born in a neonatal unit in Kandang Kerbau Hospital during the period July 1990 to July 1995. The data were collected by a manual search through 292 neonatal records during the study period.

Maternal data, antenatal ultrasound findings, obstetric and intrapartum complications, and placental morphology were assessed. Neonatal data included the mode of delivery, birth weight, gestation, Apgar scores, and details of resuscitation.

Clinical features of TTTS were studied, namely haemoglobin discrepancies, birthweight differences, presence of pallor, plethora, anaemia, polycythaemia, and hypotension. The diagnosis of TTTS was considered in monochorial twins if any of the following criteria were satisfied:

- intertwin haemoglobin difference > 5 g/100 ml
- pallor in one twin and plethora in the other
- intertwin birthweight difference > 15%

The TTTS was considered to be acute if the birthweight discrepancy was less than 15% and
if haemodynamic problems such as tachycardia or hypotension were present. The various types of treatment used were also analysed, namely plasma or normal saline infusion, inotropic support, whole blood or packed cell transfusion or partial plasma exchange transfusion for polycythaemia. Other significant neonatal problems were also reviewed, including perinatal asphyxia, hyaline membrane disease, transient tachypnoea of the newborn, congenital pneumonia, retinopathy of prematurity, necrotising enterocolitis, patent ductus arteriosus, intraventricular haemorrhage, and congenital malformations. After discharge from hospital, the infants were followed up in the outpatient clinic where the growth, development, and neurological sequelae were assessed.

Results
During the study period from June 1990 to June 1995, 292 twin pairs were admitted to our neonatology unit. In this study cohort, there were 130 female twin pairs, 149 male twin pairs, and 13 twin pairs of different sexes. Of these, 18 cases satisfied the diagnostic criteria for TTTS, giving an incidence of 6.2%. Half of the 18 twin pairs were boys, and the rest were girls. Their mean (SEM) birth weight was 1865 (502) g (range 870–3020) and gestation was 33.6 (3.2) weeks (range 27–38). The index twin pairs were classified into acute and chronic types of TTTS; 44% had the acute type. The mean (SEM) intrapair haemoglobin difference in the acute type was 4.8 (2.1) g/100 ml which gave a discordance of 7.1 (4.6)%, whereas that in the chronic type was 6.9 (2.9) g/100 ml and 24.4 (6.1)% respectively. Of the donor twins, 10 had anaemia and eight had hypotension requiring colloid or blood transfusion. Furthermore, seven donor twins had respiratory distress and three had perinatal asphyxia. Of the recipient twins, seven had polycythaemia with packed cell volume greater than 65%, and three had respiratory distress. Moreover, two recipient twins had perinatal asphyxia, and one had hypotension. Three of the infants with polycythaemia needed partial plasma exchange transfusion. Of the recipient twins, two died in utero as the result of chronic TTTS.

Infants with the acute type of TTTS had a significantly higher incidence of vaginal delivery (p < 0.03), hypotension (p < 0.025), and respiratory distress (p < 0.01) compared with those with the chronic type (table 1). There was no significant difference in the incidence of anaemia, polycythaemia, asphyxia, hypoglycaemia, and hyperbilirubinaemia.

All the survivors were followed up for a period of two years. There were no neonatal deaths among the study cohort. Physical growth was assessed from serial measurements of height, weight, and occipital frontal circumference. Neurodevelopment was also monitored from routine assessment of motor (fine/gross), visual, speech, and auditory skills. The physical and neurological development of each survivor was monitored at the ages of 3 months, 6 months, 9 months, 12 months, 18 months, and 2 years. Three pairs of affected twins were lost to follow up (one pair of which requested to be followed up by their private practitioner after six months and two pairs defaulted follow up after one year).

Overall, two of the 34 survivors with TTTS suffered neurological sequelae. All 16 infants who had the acute type showed normal growth and development on follow up (table 2). Of the 18 survivors who had the chronic type, two developed spastic cerebral palsy (one had spastic quadriplegia and the other had spastic diplegia). These two twins were donor twins whose other twin had died in utero.

Discussion
TTTS is a serious complication of monozygotic monochorionic twins resulting from a transplacental vascular communication. The incidence of TTTS in our study was 6.2%, whereas the reported incidence varies between 5 and 15%. The extreme variant of TTTS is the “stuck twin” phenomenon where one fetus lies against the uterine wall in a severely oligohydramniotic sac while the co-twin lies in a hydramniotic sac. This complication has been reported in 8% of twin pregnancies.

The most serious problem with vascular shunting is the formation of an acardiac or amorphous fetus when large artery-artery and vein-vein anastomoses form between the anomalous fetus and its usually normal co-twin. Blood enters the recipient through the umbilical artery and leaves the umbilical vein to drain into a large placental vein-vein anastomosis. Low perfusion pressure and desaturation result in an acardiac fetus. The normal twin, while perfusing the circulatory system of both twins, may develop cardiac hypertrophy, congestive cardiac failure, or hydrops.

Our study has shown that when TTTS results in the intrauterine death of one of the fetuses, the surviving twin has an adverse neu-
rodevelopmental outcome. In the two cases in
which the monochorionic twins had died in
utero, cerebral palsy with mental retardation
was the eventual outcome. This is consistent
with current literature, which attributes the
increased risk of morbidity and mortality in
the survivor to intraterine disseminated coagula-
tion initiated by the passage of thromboplastic
material from the dead twin through vascular
anastomoses. Furthermore, recent data have
suggested that rapid and profound haemo-
dynamic alterations at the time of the death of
one twin could be responsible for infarction,
necrosis, cystic periventricular leucomalacia,
and renal damage in the survivors.6 In the
series of 14 cases studied by Cincotta et al,7
periventricular leucomalacia, oliguria, and
renal failure were thought to be secondary to
hypotension caused by acute transfusion from
the donor to the recipient.

In our study, the infants who had TTTS
have been further subclassified into acute and
chronic types. When the birthweight discrep-
ancy between twins is small, the transfusion is
considered to have occurred acutely.8 A
 distinction between the acute and chronic forms of
the syndrome can be made on the basis of
weight discrepancy and haemodynamic
changes. Infants with the chronic form have
discrepancies in birth weight exceeding 15% and
the peripheral blood film of the donor twin
may show hypochromic microcytic anaemia
and erythroblastosisis. The acute forms may be
one of the emergencies encountered in the
delivery room. Severe anaemia and shock may
occur in the donor and require urgent transfu-
sion of blood. The recipient twin may be in
cardiac failure and require urgent reduction of
his/her blood volume by withdrawal of blood from
the umbilical vein.

Cord haemoglobin may be misleading in the
acute forms of the syndrome, as they may be
normal with no intrapair discrepancy. In such
instances, a full blood count performed be-
tween six and 12 hours after delivery will show
the characteristic intrapair discrepancy. Acute
severe TTTS occurs in 1% of monochorionic
pregnancies and may present as acute
hydramnios resulting in preterm labour or pre-
mature rupture of membranes. A high mor-
tality ranging between 79 and 100% has been
reported for twins with the acute types
presenting at 18–26 weeks.9 All eight twin pairs
in our study who had the acute types survived.
There were no cases of acute polyhydramnios in
our cohort and the rapid and profound
haemodynamic changes probably occurred in
the intrapartum period. Interestingly, a signifi-
cantly higher incidence of vaginal delivery was
noted in cases of acute TTTS. Prompt
recognition and management of hypotension,
anæmia, and polycythaemia is essential to
optimise neurodevelopmental outcome as
shown in the above study.

In antenatally diagnosed cases, a variety of
interventional strategies have been described.10
Repeated decompression amniocentesis has
been attempted by several authors for the relief
of maternal discomfort and also to improve
fetal outcome. However, the overall perinatal
mortality was 54.7% and it had little efficacy in
the treatment of the affected fetuses.11 Another
treatment is selective feticide, which has been
described by several authors such as Wittmann
et al,12 Weiner,13 and Chitkara et al.14 However,
their attempt to ligate the umbilical cord was
not successful. This treatment is not recom-
ended because of the potentially poor
neurodevelopmental outcome in the surviving
twin.

Treating the mother with digoxin when the
recipient twin is showing signs of cardiac
failure has had favourable results.15 Non-
steroidal anti-inflammatory agents such as
indomethacin have been tried but not shown to
improve fetal outcome.

Placental surgery has been considered as an
alternative mode of treatment in TTTS. Delia
et al15 attempted fetoscopic directed occlu-
sion of the placental vessels with a neodymium-
YAG laser in four ewes. They later used the
same method on three pairs of affected twins,
two of which survived.

In conclusion, although the incidence of
TTTS is low (6.2%), it is an important phenome-
on in view of its association with
morbidity in the affected twins. It is also shown
to result in unfavourable neurodevelopmental
outcome in the surviving twin if its co-twin dies
in utero. Furthermore, the chronic type of
TTTS is also associated with more adverse
outcome. Prompt recognition and manage-
ment of the haemodynamic and haematologi-
cal problems of infants with the acute types
of TTTS will result in optimal neurodevelopmen-
tal outcome.