**Twins**

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**Abstract**

The diagnosis of a twin pregnancy is often met with wonder and excitement by those with limited knowledge or experience of multiple gestations. And yet, the incidence of almost all obstetric complications is elevated in twin gestations above that of singleton pregnancies, and outcomes are consistently worse.

This article explores both the complications of twins in common with singleton pregnancies, and also those unique to twins. The importance of determining choriocity early in pregnancy is illustrated repeatedly, and routine antenatal management and the delivery of twins are examined critically.

**Keywords** diamniotic; dichorionic; monoamniotic; monochorionic; multiple pregnancy; twins

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**Introduction**

Twin pregnancies have fascinated physicians from the time of Hippocrates, and still provide some of the greatest challenges in obstetric care and fetal medicine today. Much has been learnt about the pathogenesis of disease by studying the development of infants who have shared the same intrauterine environment.

Twins are more commonly seen in other animal groups such as sheep, cats and dogs, although they are more unusual in horses and cattle. Whichever species is studied, twin pregnancies have a higher incidence of preterm labour, miscarriage and fetal death when compared to singleton pregnancies.

**Classification**

Dizygotic (dizygous, binovular, fraternal, or non-identical) twins result from the fertilization of two independently released ova by two different sperm. Their genetic makeup is as dissimilar as one would expect between siblings. All these twins are dichorionic and diamniotic (DCDA).

Monozygotic twins (monozygous, uniovular, identical) arise from the splitting of a single fertilized egg within the first 14 days after fertilization. Monozygous twins, depending on the timing of embryonic cleavage, may be dichorionic diamniotic (days 1–3), monochorionic diamniotic (MCDA) (days 3–8), monochorionic monoamniotic (days 9–12), or conjoined, when cleavage of the embryo occurs on day 12 or beyond.

**Incidence**

In 1980 the incidence of twins was approximately 10 per 1000 pregnancies. By 2002 this had risen to almost 15 per 1000, mostly as a result of the increasing use and availability of assisted reproductive techniques. Changes to the HFEA guidelines limiting the number of embryos transferred during IVF cycles have reversed this trend only slightly. Currently in the UK, one in 34 infants is born a twin or triplet.

Dichorionic twinning is associated with increasing maternal age. The incidence of twins is 6.3 per 1000 in mothers under the age of 20, 22 per 1000 in those between 35 and 39 years of age, and 57 per 1000 in the over-45 s.

Approximately one third of twins in the UK are monozygous and two thirds are dizygous. The rates of monozygous twins are constant throughout the world (3–5/1000 births).

**General obstetric complications**

Historical databases have reported perinatal mortality rates of 28% and 16% for monochorionic and dichorionic twins, respectively. Although the outlook has improved significantly since then, the risk of perinatal death remains 1.5% and 3% respectively, compared with 0.5% for singletons. Morbidity is also increased over that of singletons, secondary to preterm birth, death of one twin, intrapartum complications, congenital anomalies and twin–twin transfusion syndrome (TTTS).

The complications affecting twin pregnancies may be common to all pregnancies, or unique to twins and higher-order births.

The precise risk of miscarriage is very difficult to ascertain, as very early pregnancy losses often go unnoticed. Furthermore, one of a twin pair may be lost before it has even been recognized. The term ‘vanishing twin syndrome’ describes the situation where the identification of two viable fetuses in the first trimester is followed by the intrauterine demise of one of the twins at a later point. This occurs in as many as 23% of twin pregnancies diagnosed by early-first-trimester scanning. The risk of first-trimester loss of twins is undoubtedly greater than that of singletons. The data for miscarriage risk between 11 and 23 weeks’ gestation are more reliable. Values of 1%, 2% and 10% are quoted for singleton, dichorionic and monochorionic twin pregnancies, respectively, with the majority of the monochorionic losses occurring secondarily to TTTS. Recent analysis of a Japanese database reported on 24,784 twin pregnancies at 3 months’ gestation; 21,297 (88%) resulted in live births. This 12.2% fetal loss rate was three times that found in singleton gestations.

The incidence of pre-eclampsia is increased in twin pregnancies over that of singletons, and this may be related to the greater volume of trophoblast.

The National Institute of Child Health and Human Development Network of Maternal–Fetal Medicine Units reviewed the incidence of pre-eclampsia in twins. The risk of gestational hypertension was doubled (relative risk, 2.0; 95% confidence interval 1.5–2.5) compared with singletons.
interval, 1.6–2.6) and that of pre-eclampsia increased by a factor of 2.6 (2.0–3.4). The incidences of preterm delivery, fetal growth restriction and placental abruption were all increased in twin pregnancies complicated by pre-eclampsia, as would be expected. There is no consistent relationship between zygosity or chorionicity and the risk of pre-eclampsia.

Fetal growth restriction complicates approximately 5% of all singleton pregnancies. This risk increases very significantly to 20% in dichorionic twins and 30% in monochorionic twin pairs for a number of reasons. There are many causes for fetal growth restriction in twin pregnancies (see below); however, ‘adaptive growth restriction’ is a concept unique to higher-order births which suggests that the restricted in-utero environment limits the growth of multiple fetuses in a ‘physiological’ way, accounting for the slowing of growth illustrated by biometry charts constructed using data from ‘normal’ twin pregnancies. The growth rate of twins begins to lag behind that of singletons only in the later third trimester. These fetuses show no other characteristic ultrasound features of pathological growth restriction (e.g. abnormal umbilical artery Doppler recordings or reduced liquor volumes) and behave normally after birth.

Preterm birth remains the main contributor to twin perinatal morbidity and mortality. This may follow spontaneous preterm labour, or a planned delivery necessary for the treatment of various maternal and/or fetal complications such as pre-eclampsia. Preterm delivery at less than 32 weeks occurs in 1% of singleton pregnancies, 5% of dichorionic twins, and 10% of monochorionic twins. The Peristat project has recently reported that approximately half of all multiple pregnancies in the European Union are delivered preterm, and that up to a quarter of premature labours are found in multiple pregnancies. In Scotland, 9% of twins delivered prior to 32 weeks, 41% between 32 and 36 weeks, and 51% delivered at less than 37 weeks. Half of these preterm deliveries were spontaneous in onset. Assisted conception is associated with an increased risk of preterm labour in twin pregnancies.

This discussion is not exhaustive. Fetal malpresentation, placental abruption, maternal anaemia and gestational diabetes are other examples of general obstetric complications which, although non-specific, are seen with an increased incidence in twin pregnancies. Placenta praevia provides another; the risk is 5% of dichorionic twins, 5% of monochorionic twins, and 10% of dichorionic twins. The Peristat project has recently reported that approximately half of all multiple pregnancies in the European Union are delivered preterm, and that up to a quarter of premature labours are found in multiple pregnancies. In Scotland, 9% of twins delivered prior to 32 weeks, 41% between 32 and 36 weeks, and 51% delivered at less than 37 weeks. Half of these preterm deliveries were spontaneous in onset. Assisted conception is associated with an increased risk of preterm labour in twin pregnancies.

In utero death of one twin
Death of a twin in the late second or third trimester is far less common than the early loss of a twin described above as the ‘vanishing twin syndrome’. The dead twin becomes compressed between the amniotic sac of the surviving co-twin and the uterine wall as the amniotic fluid and the fluid content of the dead twin are absorbed. This results in a ‘fetus papyraceous’ which may be barely visible at delivery of the term survivor. Although a maternal coagulopathy has been reported in cases of prolonged retention of a dead twin, this is extremely rare.

A recent meta-analysis of outcomes following in-utero demise of one of a twin pair emphasizes the importance of chorionicity. Co-twin demise was found in 12% of monochorionic twin pairs, but only 4% of dichorionic twins. Rates of neurological abnormality in the survivors (18% versus 1%) and preterm delivery (68% and 57%) illustrate this point further. Death of a monochorionic twin may cause multicystic encephalomalacia in the survivor, hence the high risk of neurological disability in these twins. Although this was originally thought to result from the passage of thrombotic tissue from the dead twin to the survivor across placental vascular anastomoses, the theory currently most favoured is that the death of an MC twin results in hypotension and hypoperfusion in the co-twin because of these same anastomoses. Watershed areas in the developing brain are particularly prone to ischaemic damage. Urgent delivery of a surviving monochorionic twin is unlikely to protect it from this ischaemic damage which is thought to occur as the other twin dies. Exposure of the survivor to the risks of prematurity only adds to its problems. However, this twin may become acutely anaemic, and peak systolic velocities should be measured in the middle cerebral artery to detect this. Intrauterine transfusion may be necessary. Death of a co-twin in an MC pair at gestations beyond 16–18 weeks should be followed up by fetal magnetic resonance imaging (MRI) scans in an effort to detect porencephaly, which may occur secondarily to the ischaemia.

Discordant growth
Any discrepancy in birth weight of twins at delivery can be expressed as a percentage of the larger twin’s weight, with <15% defined as mild, 15–30% as moderate, and >30% as severe discordancy. The causes of growth discordancy are listed in Table 1. Defining and diagnosing growth discordancy in utero is usually done subjectively, although estimated fetal weights could be employed.

Smaller placentas and an increased incidence of velamentous cord insertion contribute to discordant growth in DC twins, whereas TTTS is a major cause in MC twin pregnancies.

The management of growth discordancy depends on its severity, the gestation at which it is recognized, the underlying cause, and the chorionicity of the pregnancy. Every effort should be made to reach a diagnosis, including the use of high-level ultrasound, maternal blood investigations, and possibly amniocentesis. Preterm delivery of a severely growth-restricted fetus will put the co-twin at risk of complications of prematurity, and this may not be justified if the survival chances for the smaller twin are poor, because of either extremely low birth weight or major genetic or structural defects. However, the death of a fetus in
congenital abnormalities in twin pregnancies. There are three groups:

1. abnormalities specific to twin pregnancies: for example, con-joined twins, twin reversed arterial perfusion sequence;
2. abnormalities that occur more frequently in twins, such as hydrocephalus, congenital heart disease and neural tube defects;
3. abnormalities related to the in-utero environment of a twin pregnancy (mechanical and vascular factors), e.g. talipes and congenital hip dislocation.

Management of twin pregnancies complicated by discordant abnormalities is complex, and the issue of selective termination is dealt with below. Certain anomalies may pose an added risk to the normal twin if, for example, they cause polyhydramnios (e.g. anencephaly) which may predispose to preterm labour. Death of a twin in utero is potentially damaging for the co-twin, particularly in monochorionic twin pregnancies, as discussed previously.

**Twin reversed arterial perfusion (TRAP)**

The TRAP sequence, also known as acardiac anomaly, complicates 1% of monzygotic twin pregnancies and can occur in both mono- and diamniotic monochorionic gestations.

One of the twin pair has an absent, or very rudimentary and non-functioning heart, and is maintained by diversion of deoxygenated blood from the umbilical arteries of the other twin through an arterio-arterial anastamosis on its return to the placenta. This low pressure and poorly oxygenated circulation is only able to support the development of caudal structures of the acardiac twin close to the insertion of the umbilical artery into the iliac vessels (i.e. the lower limbs). This usually means that the head and upper limbs are absent or poorly formed (the 'acardiac accephalus'). Oedema and sonoluent areas in the upper body, consistent with cystic hygroma, are common. Blood returns to the main circuit through a veno-venous anastamosis into the iliac vessels. Indeed, in some cases, the umbilical cord of the acardiac twin implants into the side of the 'pump-twin' umbilical cord.

It remains uncertain whether the absent/abnormal cardiac embryogenesis causes the condition, or whether abnormal vasculature in the placenta is the primary problem.

The parasitic acardiac twin threatens the wellbeing of the pump or donor (normal) twin in a number of ways. The 'vascular steal' phenomenon may place significant haemodynamic demands on the pump-twin, eventually leading to high-output cardiac failure and polyhydramnios. The doubly deoxygenated blood which has passed through both fetuses is returned to the umbilical vein of the normal twin via the veno-venous anastamosis, lowering the oxygen content of the venous blood reaching the pump-twin. The resulting chronic hypoxia may cause growth restriction and exacerbates cardiac failure. Finally, the acardiac twin may grow to a huge size. This, and polyhydramnios, threaten preterm labour. Prognostic features include the acardiac:pump-twin AC ratio and signs of pump-twin compromise such as hydropic change, tricuspid regurgitation, abnormal venous dopplers and fetal anaemia. The bigger the size of the acardiac twin, the greater the risk. The perinatal mortality rate associated with this condition is approximately 50%.

Management options include elective termination of pregnancy or surveillance (serial cardiotocography (CTG), ultrasound and echocardiography), with intervention when signs of decompensation or rapid acardiac twin growth are noted. Non-surgical interventions such as the use of indomethacin, digitalis and tocolysis do not treat the underlying problem. Surgical interventions aim to ablate blood flow to the acardiac twin, and a variety of methods can be used. The cord can be directly occluded by ligation, bipolar diathermy, or embolization. Alternatively, intrafetal vessels can be ablated using monopol diathermy, laser or radiofrequency techniques. The most appropriate interventions for the various clinical presentations of this disorder are as yet undetermined, and conservative non-intervention is often appropriate. Long-term follow-up data on surviving pump-twins is lacking (Figure 1).
Twin–twin transfusion syndrome (TTTS)

Twin–twin transfusion syndrome (TTTS), or polyhydramnios/oligohydramnios sequence, is a condition unique to monochorionic twin pregnancies which carries a poor prognosis. Indeed, expectant management has recorded a perinatal survival rate of only 30% (at best), with one in four survivors suffering neuro­logical disability. It complicates up to 15% of monochorionic twin pregnancies, but is rare in monoamniotic twins.

It is categorized by volume overload in one twin (‘the recipient’) which manifests as polyuria with a distended bladder and polyhydramnios. Progression of the condition commonly causes cardiomegaly, fetal doppler abnormalities, hydropic change, and ultimately death. The co-twin (the ‘donor’) is less likely to miss AVAs and therefore is less likely to become ‘stuck’ to the uterine wall and ‘shrink wrapped’ by the close apposition of the membrane to the fetus. Fetal doppler abnormalities and death may also occur as the condition progresses. Quintero et al have created a classification for TTTS (see Table 2). Although it may be too simplistic to assume that the natural history of all cases is to progress through each stage in turn, this system has at least meant that comparisons of treatments can be made with greater validity. Perinatal survival of the recipient is comparable with that of the donor, irrespective of their status. The spontaneous death of one of the twins, in the absence of previous placental surgery (see below), carries a risk of 50% to the other of death or significant neurological handicap. Polyhydramnios in the recipient sac may cause preterm rupture of membranes and/or preterm labour.

Histological examination of the placenta shows that the monochorionic twin pregnancies demonstrates three main types of anastomoses across the ‘equator’. They may be venovenous, arteriovenous, or arterioarterial. In TTTS there is an imbalance between arteriovenous anastomoses (AVA) working in each direction, resulting in a net flow toward one of the twins. This twin is destined to become the recipient. Arterioarterial anastomoses (AAAs) are thought to help restore the balance, and the more there are, the less likely is TTTS.

TTTS is rare before 16 weeks of gestation, and uncommon after 32 weeks. The onset and progression can be rapid, and fortnightly scans are recommended from 16 weeks in monochorionic twins to detect it promptly. As expectant management carries such a poor outlook, various interventions have been tried in an effort to improve prognosis, including amnioreduction, septostomy, and laser ablation. It is clear that even when treated, the risk of poor outcome is still significant, and termination of the whole pregnancy should be offered as a management option in early and severe cases.

Serial amnioreduction seems to prolong gestation in TTTS, although the mechanism of action is not known. Normalizing the amniotic fluid volume may help to prevent preterm labour and improve haemodynamics. Although the prolongation of pregnancy is comparable to laser treatment, serial amnioreduction does not address the circulatory imbalance, and repeated procedures are usually required. TTTS is rare in monoamniotic pregnancies, and amniotic septostomy has been used with some success. Moise et al performed a multicentred randomized controlled study comparing amnioreduction with septostomy in women with evidence of TTTS before 24 weeks’ gestation. The study was terminated at the interim analysis after similar results were found in the septostomy and amnioreduction groups in terms of neonatal morbidity. Septostomy was found to be advantageous as only a single procedure was required. Cord entanglement has been reported in cases where a large defect was made.

De Lia first described fetoscopic laser ablation of the communicating vessels on the chorionic plate in 1990 for the treatment of TTTS. This technique involves insertion of a fetoscope with a laser passed through an accessory channel. This is usually done under regional anaesthetic block, but local anaesthesia is considered sufficient by some. A ‘selective’ approach aims to destroy only the AVAs, whereas the non-selective approach cauterizes the full length of the placental equator without discrimination. The latter is less likely to miss AVAs and therefore is less likely to need repeating. Critics argue that the beneficial AAAs will also be ablated and that subsequent growth restriction of one of the survivors is more common.

A multicentre European randomized controlled trial published by the Eurofetus alliance in 2004 compared laser coagulation with serial amnioreduction in the treatment of TTTS presenting before 26 weeks of gestation. Approximately 70 women were randomized to each group, and the study was stopped prematurely when the interim analysis demonstrated significantly higher survival rates in the laser group (76% of at least one twin) compared to the amnioreduction group (51%). The mean gestation at delivery was significantly higher for the laser group (33 weeks versus 29 weeks). Periventricular leukomalacia was less common in those treated with laser (6% versus 14%), as were all neurological complications (31% versus 52%).

Laser ablation has become the treatment of choice for more advanced stages of TTTS at gestations of less than 26 weeks. Most argue that there is still a place for amnioreduction in TTTS complicating pregnancies beyond 26 weeks and in stage-I and perhaps stage-II cases, where one amnioreduction may be all that is required. Other experts would argue that these ‘mild’ cases should be managed expectantly until they progress to a higher stage.

### Quintero criteria

<table>
<thead>
<tr>
<th>Stage</th>
<th>Condition</th>
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<tbody>
<tr>
<td>I</td>
<td>Polyhydramnios in the recipient, severe oligohydramnios in donor but urine visible in the bladder in the donor</td>
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<tr>
<td>II</td>
<td>Polyhydramnios in the recipient, a stuck donor, urine not visible in the donor’s bladder</td>
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<tr>
<td>III</td>
<td>Polyhydramnios and oligohydramnios, abnormal dopplers (at least one of absent or reverse end-diastolic flow in the umbilical artery, reverse flow in the ductus venosus, or pulsatile umbilical venous flow), with or without urine visible in the donor’s bladder</td>
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<tr>
<td>IV</td>
<td>Presence of ascites or frank hydrops (fluid collection in two or more cavities) in either donor or recipient</td>
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<tr>
<td>V</td>
<td>Demise of either fetus</td>
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Table 2
Antenatal management of multiple pregnancies

Determining chorionicity

Determining the chorionicity of a twin pregnancy is essential when planning routine care and managing rare complications. Monozygotic twins account for 30% of all twin conceptions. Approximately 25% of these are dichorionic, resulting from an early division of the embryo within the first 3 days post-fertilization. All dizygotic twins are dichorionic. It is a common mistake to say to women with dichorionic twins that the twins are ‘non-identical’ (dizygous). One in seven dichorionic pregnancies are monozygous (identical).

Scans performed between 10 and 14 weeks of gestation are both sensitive and specific for determining chorionicity. Carroll has shown that the most accurate predictors of dichorionic twins are the detection of two placental masses and the lambda sign (sensitivity 97.4%, specificity 100%). The latter refers to the triangular projection of chorionic villi which lies between the two layers of chorion at their origin from the placenta. This is absent in monochorionic twins, which instead mostly display the ‘T’ sign where the membrane reaches the placenta at a 90° angle. In later gestations, measurements of the inter-twin membrane thickness may be performed, although this is less accurate. The mean thickness in monochorionic pregnancies is 1.4 mm, compared with 2.4 mm in dichorionic twins. There is very significant overlap. Discordant sex may be used after 18 weeks’ gestation, although 40% of dichorionic pregnancies are the same sex.

The lambda sign is lost in a significant number of twin pregnancies as gestation progresses. Determination of chorionicity should therefore be a routine part of the dating scan in twin pregnancies. Monochorionic twins should be scanned fortnightly from 16 weeks’ gestation to detect early changes of TTTS or growth restriction. Dichorionic twin pregnancies, with no other risk factors, are usually scanned on a 4-weekly basis, starting at 24 or 28 weeks’ gestation.

Screening for trisomy 21

In 2004 19% of all singleton births occurred to women who were 35 or older. In contrast, 27% of twins were born to this older age group, and this is mostly explained by the impact of assisted conception and the increase in spontaneous dichorionic twins with maternal age. Discussing screening for trisomy 21 with older couples who have a twin pregnancy is a common event, but a complex issue.

All monochorionic twins are monozygotic, and in these twin pregnancies, with very rare exceptions, both fetuses have the same karyotype, be it normal or aneuploid. The age-related risk of both babies having Down syndrome is therefore the same as the risk for a singleton. Because most dichorionic twins are dizygotic, the risk of one of the pair having Down syndrome is (approximately) twice the age-related risk for a singleton. The chance of both having Down syndrome is very small.

Serum screening for trisomy 21 is possible in twin pregnancies, and detection rates are better than when using maternal age alone to determine who should have invasive testing. The level of serum markers is twice that expected of a singleton pregnancy. However, the chromosomally normal twin has biochemical which serves to mask the abnormal biochemistry of the twin with trisomy 21, decreasing the sensitivity of the test.

Neveux demonstrated sensitivities of 73% for monozygous and 43% for dizygous twins, with a false-positive rate of 5% using second-trimester serum screening. Assisted conception is associated with increased levels of free human chorionic gonadotropin β (hCG), and leads to very high false-positive rates if no adjustment is made.

The ultrasound estimation of the nuchal translucency (NT) between 10 and 14 weeks’ gestation in twin pregnancies has similar sensitivities as in singleton pregnancies. The specificity is lower for monochorionic twin pregnancies, and this may reflect discrepancies in early nutrient supply or vascularization in these pregnancies. So, although an individual risk based on the two NT measurements is given for each fetus of a dichorionic pair, only one is given for monochorionic twins (the mean of the two). This then is the risk that both will have Down syndrome. Marked discrepancy in the NT measurements of a monochorionic twin pair is highly suspicious of imminent TTTS.

Spencer has proposed that the combination of NT and maternal serum biochemistry will allow rates of detection of trisomy 21 approaching 80% in twin pregnancies, and argues that the benefit of the NT is in allowing the identification of the affected twin.

Invasive testing for twins

As dichorionic twins are mostly dizygous, it is usually the case that if one twin has an abnormal karyotype the other twin will be normal. Both placentas or amniotic sacs must therefore be sampled in cases of elevated risk. Monochorionic twins are monozygous, and chromosomal discrepancy in these pregnancies has only rarely been reported. Many believe that sampling of one twin only is adequate in these cases provided that both twins appear structurally normal. Of paramount importance with any technique is clear mapping of the twins and their placental locations. Discordant results may result in a request for selective termination, and the affected twin must be readily identified by placental site, sex (if they are male and female) or anomaly (if they are discordant for this). The miscarriage rate with twin invasive testing is likely to be higher than singleton pregnancies, although there is no high-quality evidence to support this statement. A value of 2% has been suggested, and there is some evidence supporting this. The Green Top Guideline from the Royal College of Obstetricians and Gynaecologists (RCOG) recommends that only operators with the skills to perform a selective termination and the affected twin must be readily identified by placental site, sex (if they are male and female) or anomaly (if they are discordant for this). The miscarriage rate with twin invasive testing is likely to be higher than singleton pregnancies, although there is no high-quality evidence to support this statement. A value of 2% has been suggested, and there is some evidence supporting this. The Green Top Guideline from the Royal College of Obstetricians and Gynaecologists (RCOG) recommends that only operators with the skills to perform a selective termination and the affected twin must be readily identified by placental site, sex (if they are male and female) or anomaly (if they are discordant for this). The miscarriage rate with twin invasive testing is likely to be higher than singleton pregnancies, although there is no high-quality evidence to support this statement. A value of 2% has been suggested, and there is some evidence supporting this. The Green Top Guideline from the Royal College of Obstetricians and Gynaecologists (RCOG) recommends that only operators with the skills to perform a selective termination and the affected twin must be readily identified by placental site, sex (if they are male and female) or anomaly (if they are discordant for this). The miscarriage rate with twin invasive testing is likely to be higher than singleton pregnancies, although there is no high-quality evidence to support this statement. A value of 2% has been suggested, and there is some evidence supporting this. The Green Top Guideline from the Royal College of Obstetricians and Gynaecologists (RCOG) recommends that only operators with the skills to perform a selective termination and the affected twin must be readily identified by placental site, sex (if they are male and female) or anomaly (if they are discordant for this). The miscarriage rate with twin invasive testing is likely to be higher than singleton pregnancies, although there is no high-quality evidence to support this statement. A value of 2% has been suggested, and there is some evidence supporting this. The Green Top Guideline from the Royal College of Obstetricians and Gynaecologists (RCOG) recommends that only operators with the skills to perform a selective termination and the affected twin must be readily identified by placental site, sex (if they are male and female) or anomaly (if they are discordant for this). The miscarriage rate with twin invasive testing is likely to be higher than singleton pregnancies, although there is no high-quality evidence to support this statement. A value of 2% has been suggested, and there is some evidence supporting this. The Green Top Guideline from the Royal College of Obstetricians and Gynaecologists (RCOG) recommends that only operators with the skills to perform a selective termination and the affected twin must be readily identify...
Selective termination and multifetal pregnancy reduction
Detection of a congenital malformation or aneuploidy affecting one twin needs careful and patient counselling of the parents. In the context of a dichorionic twin pregnancy, intracardiac potassium chloride may be used as there are no placental vascular anastomoses. However, in a monochorionic twin pregnancy placental anastomoses preclude the injection of lignocaine or potassium chloride for fetocide because of the risk these carry to the unaffected twin. Cessation of blood flow through the umbilical cord can be achieved using fetoscopic umbilical cord ligation, laser coagulation, or bipolar thermocoagulation. Interstitial laser has been used at earlier gestations. There are no trials adequately comparing these techniques, but it can be assumed that rates of miscarriage/preterm rupture of membranes will be significantly higher than those following selective termination in dichorionic twin pregnancies, where a 7.1% fetal loss rate was found in a study of over 400 cases performed prior to 24 weeks’ gestation.

Multifetal pregnancy reduction (MFPR) is principally performed to reduce the morbidity and mortality associated with higher-order pregnancies, although it has also been used for social reasons. Most of the evidence suggests that the outcome for triplets and quadruplets reduced to twins is almost as good as that as if the pregnancy had started as twins, although this is highly operator-dependent. Potassium chloride is injected into the fetal heart under ultrasound guidance. Triplet pregnancies with a monozygotic twin pair will usually be reduced from three to one, leaving the singleton. Miscarriage rates fall from 15% in triplets to approximately 5–7% in pregnancies reduced to twins or singletons. When MFPR has taken place, the risk of being born weighing less than 1500 g falls from 35% for triplets to 10% for twins and <5% for singletons. Furthermore, there is also evidence to suggest that reduction from twins to singleton also improves outcomes, although the ethics of this are even more contentious than reduction from higher-order pregnancies.

Prediction and prevention of pre-term labour in multiple pregnancies
Preterm labour is a major cause of perinatal morbidity and mortality in twin pregnancies. The combination of cervical-length scanning and fetal fibronectin detection can predict preterm labour with a high degree of sensitivity; however, until recently treatment options have been limited. A closed cervical length of 25 mm is a valuable threshold below which the risk increases significantly. Routine use of cervical cerclage in twins may actually increase the risks of preterm labour, although it still has a place in asymptomatic cases where the cervix is short. The number needed to treat is high, and the benefit marginal.

There is increasing evidence in singleton pregnancies that progesterone has a role to play in the prevention of preterm labour. A Cochrane meta-analysis by Dodd concludes that although progesterone is associated with a reduction in the risk of preterm birth at <37 weeks’ gestation and an infant birth weight <2500 g, it is unclear whether the prolongation of gestation translates into improved longer-term infant health outcomes. Some remain cautious about the effects of progesterone supplementation during pregnancy, and long-term data are not yet available.

The STOPPIT study is a randomized placebo-controlled trial designed to determine whether vaginal progesterone supplements are effective in preventing preterm delivery (before 34 weeks of pregnancy) in twin pregnancy.

Management of delivery
Timing of delivery
The late third trimester is characterized by increased maternal discomfort, heartburn and anxiety, and these problems are all more likely to occur in multiple pregnancies and from earlier gestations. Induction of labour may be requested prior to 40 weeks by the woman herself; however, there also exists a common obstetric belief that twins should be delivered prior to full term.

A single randomized controlled trial comparing the elective induction of labour at 37 weeks’ gestation with expectant management (i.e. awaiting spontaneous labour) in 36 twin pairs found no difference between the groups with regard to the need for caesarean section, fetal compromise, APGAR scores or birth weight. The conclusion was that the study was too small to recommend elective induction at 37 weeks’ gestation.

A study of 60 443 twin pregnancies in the USA analysed the outcomes of twin pregnancies based on gestational age at delivery. This showed a significant increase in neonatal mortality after 40 weeks’ gestation (first twin OR = 3.5 [95% CI 2.3–5.4]; second twin OR = 2.5 [1.8–3.7]) and also in neonatal morbidity. Although this is a retrospective study, and no data were available on chorioicity, it does demonstrate the greater incidence of respiratory distress prior to 38 weeks’ gestation, and a significant increase in both neonatal morbidity and mortality when twin pregnancies are managed expectantly after 40 weeks’ gestation, perhaps supporting the common current practice of induction of labour or caesarean section at 38–39 weeks’ gestation.

Monoamniotic twin pregnancies are usually delivered by 34 weeks’ gestation, following administration of steroids, as the risk of intrauterine fetal death is significantly elevated over other twin types, probably because of acute cord-related events secondary to entanglement. There is a move to deliver uncomplicated monochorionic twin pregnancies earlier also (by 37 weeks’ gestation) to limit the harm caused to the surviving twin if one should die in utero in the late third trimester.

Mode of delivery
There is general agreement that monoamniotic pregnancies should be delivered by caesarean section in view of the risk of cord entanglement, cord prolapse, and clamping of the wrong cord after the delivery of the first twin. In monochorionic diamniotic pregnancies there is a possibility of acute TTTS in labour, and this has encouraged a more widespread use of elective abdominal delivery, even in the absence of any other obstetric problems. One retrospective study evaluated the mode of delivery in monochorionic twin pregnancies; no difference was found in perinatal morbidity or mortality between the groups having caesarean section or vaginal delivery. The need for caesarean delivery is greater in monochorionic twins, however, because of the greater incidence of complicating factors.

The elective surgical delivery of uncomplicated dichorionic twins has previously been restricted to pregnancies complicated by growth restriction and other common obstetric indications. Breech presentation in the first twin is now an accepted indication for elective caesarean section, the aim being to avoid the rare
complication of ‘locked twins’, when the head of the first twin is hyperextended and ‘locks’ with the head of the second twin which is at a lower station in the uterus than the head of the presenting twin. The American College of Obstetricians and Gynaecologists (ACOG) also recommends caesarean section when the estimated weight of the second twin is <1500 g or >4000 g. The lie and presentation of the second twin features less in decision-making. One in five second twins will change their presentation after the delivery of the first, and internal podalic version, external version, breech extraction and assisted breech delivery are all accepted currently as reasonable options for the management of the second twin with abnormal lie or malpresentation. However, the increased possibility of premature placental separation, cord prolapse, and physical birth trauma do have an impact on the outcomes of second twins delivered vaginally.

A recent retrospective cohort study of birth order and risk of perinatal death in the UK between 1994 and 2003 has shown an odds ratio of 2.3 (1.7–3.2) for perinatal death in the second twin of pregnancies delivering beyond 36 weeks, and that this increase in risk is greater when deaths caused by intrapartum anoxia or trauma are taken in isolation. Furthermore, there exists a trend toward greater risk of death in term second twins when delivered vaginally. Armson reached similar conclusions in Nova Scotia in a study of twin perinatal morbidity and mortality between 1998 and 2002. The risk was also increased in cases of discordant birth weight and prolonged inter-twin delivery interval (which they defined as a delay >30 minutes from the delivery of the first twin to the delivery of the second twin). The risk of adverse outcome was also independent of chorionicity. The group concluded that elective caesarean sections at term could improve the perinatal outcome of the second twin. The University of Toronto is coordinating a multicentre randomized controlled trial of elective caesarean section for term twin pregnancies, but many already are predicting that this will show significantly greater perinatal morbidity and mortality in the group delivered vaginally. Indeed, the trend for elective caesarean section for uncomplicated dichorionic twins is already evident, with almost two thirds of all twin pregnancies being delivered electively by caesarean section in some units in the UK.

It is clear that there is a need for senior obstetric input during all twin vaginal deliveries. Measures are also required to ensure adequate fetal-heart-rate monitoring of both twins, at all times, and to reduce the inter-twin delivery interval, such as by commencing an oxytocin infusion to ensure adequate contractions. It has been widely advocated that the twin–twin delivery interval should preferably be no more than 15 minutes and should not be allowed to exceed 30 minutes. The use of oxytocin, breech extraction, or instrumental delivery has been recommended to shorten the inter-twin interval; however, these interventions may themselves increase perinatal morbidity, and not all experts agree.

Yeung found that the umbilical cord pH, partial pressure of CO₂ and base excess in the second twin deteriorate as the twin–twin delivery interval increases, and their conclusions support a maximum twin–twin delivery interval of 30 minutes.

In reality there remains little scientific evidence to support artificial limitations of the inter-twin interval, although continuous fetal-heart-rate monitoring, immediate access to the obstetric theatres, and the presence of experienced staff are all assumed prerequisites for a safe second-twin delivery.

FURTHER READING


Practice points

- It is essential that the chorionicity of a twin pregnancy is determined as early as possible in the pregnancy
- The management of discordant growth or anomalies is influenced by chorionicity
- Counselling for Down syndrome screening in twin pregnancies is a complex issue and is best done by a clinician who is able to offer CVS, amniocentesis and selective termination
- Invasive testing of twin pregnancies is possible, as is selective termination
- Although there is a trend toward the surgical delivery of twins by caesarean section, and the morbidity and mortality of the second twin may be greater following vaginal birth, the results of a large randomized trial are awaited
- The value of progesterone in the prevention of preterm labour is being investigated in a large multicentre trial
- There is little evidence to support limitation of the inter-twin delivery interval, but common practice is to expedite delivery of the second baby if undelivered by 30 minutes

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