Twin pregnancy: Management of pregnancy complications

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INTRODUCTION

Many aspects of routine prenatal care and counseling of patients with twin pregnancies are the same as in singleton pregnancies (see "Prenatal care: Initial assessment" and "Prenatal care: Second and third trimesters" and "Prenatal care: Patient education, health promotion, and safety of commonly used drugs"). However, twin pregnancy is associated with higher rates of almost every potential complication of pregnancy, with the exceptions of postterm pregnancy and macrosomia, and is also associated with some unique complications.

Most pregnancy complications (eg, gestational hypertension, gestational diabetes) are managed similarly in twins and singletons because both twins are affected by the condition. For some conditions, however, one twin is affected but the other twin is not or is less seriously affected; therefore, the risks and benefits of any intervention are different for each fetus.

This topic will review our approach to selected pregnancy complications in patients with twin pregnancies. Our approach is generally consistent with recommendations of major organizations worldwide (see "Twin pregnancy: Routine prenatal care", section on 'Society guideline links'). Other important issues related to twin pregnancy are reviewed in detail separately:

- (See "Twin pregnancy: Overview".)
- (See "Twin pregnancy: Routine prenatal care".)
- (See "Twin pregnancy: Labor and delivery".)
- (See "Monoamniotic twin pregnancy (including conjoined twins)".)
- (See "Twin-twin transfusion syndrome and twin anemia polycythemia sequence: Screening, prevalence, pathophysiology, and diagnosis" and "Twin-twin transfusion syndrome: Management and outcome".)
- (See "Selective fetal growth restriction in monochorionic twin pregnancies".)
- (See "Multifetal gestation: Role of delayed-interval delivery".)

DEATH OF ONE TWIN

Fetal death in twin pregnancies is not rare. In one study in which both twins were alive at 11 to 13 weeks of gestation, approximately 97 percent of 4896 dichorionic twin pregnancies and 89 percent of 1329 monochorionic twin pregnancies had two live fetuses or two live births at <34 weeks of gestation [1]. The rate of single fetal death at <34 weeks with the co-twin alive ≥3 days later was 3.5 percent for monochorionic twins and 1.2 percent for dichorionic twins. Obviously, the frequency of fetal demise is higher if losses before 11 to 13 weeks are included.

Single fetal demise is a serious concern in monochorionic twins because of the placental vascular anastomoses. The intrauterine death of one twin in a monochorionic pregnancy can cause acute hypotension, anemia, and ischemia in the co-twin due to exsanguination into the low-pressure vascular system of the deceased twin, resulting in morbidity or death of the co-twin. In a dichorionic pregnancy, this sequence is not a concern since there are no placental vascular anastomoses; however, death of one twin may reflect an adverse intrauterine environment that could also place the co-twin at risk for morbidity or mortality.

The outcome of twin pregnancies with a single fetal demise was shown in a systematic review of studies that evaluated the prognosis of the co-twin following a single twin death after 14 weeks (monoamniotic twins were excluded) [2]. Following intrauterine demise of one twin:

- The rates of fetal demise of the co-twin in monochorionic and dichorionic pregnancies were 41 and 22 percent, respectively (comparing monochorionic versus dichorionic: odds ratio [OR] 2.06, 95% CI 1.14-3.71).
- In monochorionic pregnancies, 20 percent of co-twin survivors had abnormal antenatal cranial imaging.
- The rates of preterm birth in monochorionic and dichorionic pregnancies were 59 and 54 percent, respectively (comparing monochorionic versus dichorionic: OR 1.42, 95% CI 0.67-2.99).
- The rates of abnormal postnatal cranial imaging in monochorionic and dichorionic pregnancies were 43 and 12 percent, respectively (comparing monochorionic versus dichorionic: OR 5.41, 95% CI 1.03-28.56).
- The rates of neurodevelopmental impairment of the co-twin in monochorionic and dichorionic pregnancies were 29 and 10 percent, respectively (comparing monochorionic versus dichorionic: OR 3.06, 95% CI 0.88-10.61).
- The rates of neonatal death of the co-twin in monochorionic and dichorionic pregnancies were 28 and 21 percent, respectively (comparing monochorionic versus dichorionic: OR 1.95, 95% CI 1.00-3.79). In addition, in monochorionic twins, a single fetal death before 28 weeks of gestation increased the risk for co-twin fetal and neonatal death compared with single fetal death after 28 weeks.

While the risk to the surviving co-twin in a monochorionic pregnancy is clear when the death of one twin occurs in the second or third trimester, the risk with death of one twin in the first trimester is unclear. It has been hypothesized that congenital anomalies and cerebral palsy may be attributable to early fetal loss of one conceptus in a twin gestation [3]. A retrospective study using data from the population-based Northern Multiple Pregnancy Register and Northern Congenital Abnormality Survey in the United Kingdom provided support for this theory. The risk of a congenital anomaly in the survivor following loss of a co-conceptus before 16 weeks of gestation was more than twice that in twin births [4]. These data may reflect, at least in part, the known increased risk of concordant and discordant congenital anomalies in monozygotic twins, which may lead to early in utero death of one twin if the anomaly is severe. Prospective studies are needed to clarify these relationships.

Compared with pregnancies conceived as singletons, additional risks to the survivor after demise of one twin include a 120 g reduction in mean birth weight, an increased risk of small for gestational age birth, and an increased risk of preterm birth [5].

Management — The optimal management of pregnancies in which one twin is likely to die or has died is unclear in pregnancies that have reached the stage of viability. Delivery timing must be individualized based on the clinical scenario.

- **Dichorionic twins** – In dichorionic twins, death of one twin is not, by itself, a strong indication for early delivery of the surviving twin. However, if a condition affecting both twins is present (eg, preeclampsia, chorioamnionitis), then close surveillance and timely delivery of the surviving twin are indicated to prevent a second fetal loss. Timely delivery depends on the condition that is present (eg, prompt delivery for chorioamnionitis versus consideration of expectant management of preeclampsia without severe features before 34 weeks of gestation and a normal surviving co-twin).

- **Monochorionic twins** – Death of one twin of a monochorionic pair may have direct harmful effects on the survivor because of intertwin vascular anastomoses. The hemodynamic changes that occur upon death of one twin are immediate; therefore, prompt delivery after death to prevent damage to the survivor appears to be futile [6]. Management should be based on the maternal condition and the condition of the surviving fetus. In the absence of a maternal indication or another fetal indication for prompt delivery, delivery before 34 weeks of gestation is not recommended and the author's practice is to deliver these pregnancies at 36+0 to 36+6 weeks. (See "Twin pregnancy: Labor and delivery", section on 'Timing of delivery'.)

  When one twin dies prior to the limit of viability, our practice is to discuss the option of pregnancy termination, although, as stated above, the risk of neurologic injury to the co-twin is not clear when the death occurs in the first trimester (the risk of co-twin death, however, can be predicted [7]). In ongoing pregnancies, ultrasound and magnetic resonance imaging evaluation of the surviving co-twin can identify signs of brain injury, such as ventriculomegaly, white matter lesions, or intracranial hemorrhage, which develop over time and may be helpful in predicting prognosis if abnormal. However, the performance of imaging studies to predict or exclude fetal brain injury in this setting is unknown. In the absence of a maternal indication or another fetal indication for prompt delivery, the author's practice is to deliver these pregnancies at 36+0 to 36+6 weeks.

  On the other hand, if fetal assessment after 26 weeks of gestation suggests impending death (rather than demise) of one twin of a monochorionic pair, we suggest prompt delivery of both twins rather than expectant management given the high risk of neurologic impairment in the surviving co-twin.

  It is not necessary to monitor for maternal coagulopathy in these cases since it is rare. Maternal hypofibrinogenemia or disseminated intravascular coagulation following death of one fetus of a multiple gestation has been described in only a few case reports [8-12]. Although some experts have treated these patients with a short course of heparin, spontaneous resolution of hypofibrinogenemia occurs without therapy. We would only consider heparin therapy if there is active hypofibrinogenemia-related bleeding, hypofibrinogenemia in a patient at high risk of hemorrhage such as with placental previa or abruptio placenta, or if there are thrombotic complications. We have not seen clinical bleeding with hypofibrinogenemia in this setting. (See "Disseminated intravascular coagulation (DIC) in adults: Evaluation and management".)

Anti-D immune globulin prophylaxis is recommended for D-negative patients. (See "RhD alloimmunization: Prevention in pregnant and postpartum patients", section on 'Prophylaxis after pregnancy complications associated with fetomaternal bleeding'.)

PRETERM LABOR AND DELIVERY

Overview — The major source of perinatal morbidity and mortality in twin gestations is preterm birth (see "Twin pregnancy: Overview", section on 'Outcome'). The high preterm birth rate is related, in part, to medically indicated preterm delivery, especially because of complications related to monochorionicity (eg, twin-twin transfusion syndrome [TTTS], selective fetal growth restriction [sFGR]). Spontaneous preterm birth (sPTB) is also increased, related, at least in part, to increased myometrial distension leading to more frequent and greater myometrial contractility compared with singleton pregnancies [13,14].

Some reported risk factors for preterm birth that are unique to twin pregnancy include: male-male twin pairs [15-17], spontaneous reduction of one fetus (eg, triplets reduced to twins deliver at an earlier gestational age than twins that did not result from reduction of a higher order multiple gestation) [18], and a preceding spontaneous singleton "early term" birth followed by a subsequent twin pregnancy (odds ratio [OR] 3.5) [19]. General risk factors for preterm birth are reviewed separately. (See "Preterm birth: Risk factors, interventions for risk reduction, and maternal prognosis", section on 'History of spontaneous preterm birth'.)

In general:

- There is no convincing evidence that routine prophylactic use of tocolytics [20], a pessary [21-23], cerclage [24,25], or supplemental progesterone (vaginal or intramuscular) [26,27] in twin pregnancies in which the cervix is normal (ie, not dilated or short) in the second trimester reduces the chances of preterm birth [28].

  In contrast, a history-indicated cerclage is reasonable in patients with a classic history for cervical insufficiency in a previous singleton pregnancy. (See "Cervical insufficiency", section on 'Obstetric history-based diagnosis' and "Cervical insufficiency", section on 'Obstetric history-based cervical insufficiency'.)

- A short course of tocolytics may be indicated for patients with acute preterm labor (see 'Use of tocolytics for acute preterm labor' below), while patients with asymptomatic cervical dilation may be treated with a cerclage, and patients with a short cervix may be treated with vaginal progesterone or possibly a cerclage or pessary. (See 'Approach to patients with asymptomatic cervical dilation' below and 'Approach to patients with a short cervix' below.)

- Systematic reviews of randomized trials of hospitalization or bed rest in twin gestations have failed to show that either intervention increases gestational age at delivery [29-31], and bed rest can increase the risk of venous thromboembolism [32].

- Although an elevated fetal fibronectin level [33-35] may predict pregnancies at particularly increased risk of preterm birth, we do not perform this test in asymptomatic patients since the predictive value is low in the absence of symptoms and no intervention has been clearly proven to be effective in reducing preterm birth rates in this population. (See "Preterm birth: Risk factors, interventions for risk reduction, and maternal prognosis", section on 'Biomarkers'.)

- Home uterine activity monitoring (HUAM) effectively detects preterm contractions; however, use of HUAM does **not** lead to a reduction in the rate of preterm birth or improvement in any measure of neonatal outcome [36].

- There may be a role for delayed-interval delivery in carefully selected twin pregnancies at an early gestational age (<24 weeks) in which only the first (presenting) fetus spontaneously delivers vaginally due to preterm labor. (See "Multifetal gestation: Role of delayed-interval delivery".)

Use of tocolytics for acute preterm labor — Although not evaluated in large randomized trials of twin pregnancies alone, a brief course of tocolysis in patients with acute preterm labor is reasonable to allow a course of antenatal corticosteroids [37]. We prefer to use calcium channel blockers or indomethacin (if gestational age is <30 to 32 weeks) and avoid beta-adrenergic agents as the risk of pulmonary edema is higher in patients with twin pregnancies because they have a higher blood volume and lower colloid osmotic pressure than patients carrying singletons. Use of tocolytic drugs for inhibition of symptomatic preterm labor is discussed separately. (See "Inhibition of acute preterm labor".)

Approach to patients with asymptomatic cervical dilation — For patients with twin pregnancies with asymptomatic cervical dilation before 24 weeks, we suggest physical examination-indicated cerclage after performing amniocentesis in the sac of the presenting twin to exclude subclinical infection. Alternatively, the patient can be observed for several hours to look for clinical signs of infection (eg, fever, uterine contractions) (see "Cervical insufficiency", section on 'Physical examination-based diagnosis'). Patients who decline cerclage are offered treatment with vaginal progesterone, similar to patients with a short cervix. (See 'Approach to patients with a short cervix' below.)

Our approach is based on findings of the only randomized trial of physical examination-indicated cerclage in twin pregnancies, which found a reduction in sPTB and perinatal mortality [38], in agreement with previous observational data [24]. In this trial, 30 twin pregnancies with asymptomatic cervical dilation of 1 to 5 cm at 16+0 to 23+6 weeks of gestation were randomly assigned to receive cerclage or no cerclage. The use of tocolytics and antibiotics was at the discretion of the physician performing the cerclage, though all 14 patients who underwent cerclage received prophylactic antibiotics (cephalosporin in 12, clindamycin-gentamycin in one, and azithromycin in one) and

indomethacin (50 to 100 mg loading dose followed by 25 to 50 mg every six hours for 48 hours). Before randomization, patients with vaginitis or urinary tract infection were treated, and subclinical chorioamnionitis was excluded by either amniocentesis or 12 hours of observation for signs of labor or infection. The cerclage group had reductions in:

- sPTB <24 weeks (29 versus 85 percent, relative risk [RR] 0.35, 95% CI 0.16-0.75)
- sPTB <28 weeks (41 versus 85 percent, RR 0.49, 95% CI 0.26-0.89)
- sPTB <32 weeks (65 versus 100 percent, RR 0.65, 95% CI 0.46-0.92)
- sPTB <34 weeks (71 versus 100 percent, RR 0.71, 95% CI 0.52-0.96)
- Perinatal mortality (18 versus 77 percent, RR 0.23, 95% CI 0.10-0.49, number needed to treat 1.7)

Cerclage increased the mean gestational age at delivery (29 versus 22.5 weeks). There were no intraoperative complications. The trial was terminated early by the data safety monitoring board because of the significant decrease in perinatal mortality in the cerclage group. Because of this, subanalysis based on the degree of cervical dilation, gestational age at placement, and use of progesterone or surgical techniques could not be performed. Though this trial was small, with only 30 patients enrolled in eight sites over four years, the data suggest a clear benefit in appropriately selected patients.

Approach to patients with a short cervix — The management of a short cervix in twin pregnancies continues to evolve, with little consensus among authorities.

Patient selection for vaginal progesterone — For patients with twin pregnancies and a short, closed cervix on second trimester transvaginal ultrasound examination, we suggest vaginal progesterone therapy to reduce the risk of preterm birth, especially in patients with no prior history of preterm birth. The author of this topic uses <20 mm as the threshold to define a short cervix in the mid-trimester in patients with no prior spontaneous birth [39,40], while some other UpToDate contributors use ≤25 mm for all patients [41]. As there are no high-quality data to support one of these thresholds over the other, the threshold chosen is based on the provider's assessment of the risks and benefits of over- versus under-treatment.

In a 2017 meta-analysis of individual patient data from six randomized trials of patients with twin gestations and midtrimester cervical length ≤25 mm, vaginal progesterone reduced preterm birth <33 weeks compared with no treatment/placebo (RR 0.69, 95% CI 0.51-0.93; 50/159 [31 percent] versus 62/144 [43 percent]) [41]. The relative risks of neonatal death, respiratory distress syndrome, and birth weight <1500 g were also reduced significantly, on average by 30 to 50 percent. Over 80 percent of the participants in these trials had no previous sPTB. However, not providing progesterone supplementation in this setting is also reasonable as these findings are not definitive. (See "Progesterone supplementation to reduce the risk of spontaneous preterm labor and birth", section on 'Twin pregnancy'.)

Patient selection for cerclage — Placement of a cerclage is also an option on a case-by-case basis when the cervix is very short and the surgeon believes the cerclage can be placed safely. Some contributors of this topic use a threshold of ≤15 mm for considering cerclage [24,25] and others use <20 mm, with consideration of the patient's past obstetric history. For example, we are more likely to consider cerclage in a patient with a past history of preterm birth and vaginal progesterone in a patient with no such past history since cervical insufficiency is more likely in a patient with a past history of preterm birth. (See "Cervical insufficiency", section on 'Ultrasound-based diagnosis'.)

Data supporting the benefit of cerclage for a short, closed cervix are not strong; thus, not placing a cerclage is also reasonable. In a meta-analysis of ultrasound-indicated cerclage in twin pregnancies (three randomized trials and three cohort studies), compared with no cerclage, cerclage placement was associated with prolongation of pregnancy in those with cervical length ≤15 mm (mean difference 3.89 weeks of gestation, 95% CI 2.19-5.59) and a reduction in preterm birth <37 weeks of gestation (RR 0.86, 95% CI 0.74-0.99), <34 weeks (RR 0.57, 95% CI 0.43-0.75),

and <32 weeks (RR 0.61, 95% CI 0.41-0.90) [24]. No benefit was observed in pregnancies with cervical lengths of 16 to 24 mm, and no improvement in neonatal outcome was demonstrated. Most patients in the overall analysis were in retrospective cohort studies. Importantly, when only patients in randomized trials were analyzed, ultrasound-indicated cerclage was associated with higher rather than lower risks of birth weight <1500 g and <2500 g, although the number of pregnancies in these trials was small.

Role of pessary — Use of a cervical pessary may be considered in twin pregnancies with a short cervix, based on the favorable results and trends in the randomized trials described below; however, we are not advising our patients to use a pessary because no consistent benefit in composite neonatal morbidity has been documented for any cervical length cutoff. We believe that further study demonstrating a clear and consistent benefit is needed before recommending cervical pessary for a short cervix in asymptomatic patients or following threatened preterm labor. ACOG recommends not using a cervical pessary for prevention of preterm birth in twin pregnancies with a short cervix [42].

- In a multicenter randomized trial in Spain, placement of a pessary in 137 asymptomatic women with twin pregnancies and a short cervix (≤25 mm) at 18 to 22 weeks reduced the rate of sPTB <34 weeks: 16.2 (11/68) versus 39.4 percent (26/66) with expectant management (RR 0.41, 95% CI 0.22-0.76) [43]. This reduction was associated with a trend toward reduction in neonatal morbidity that was not statistically significant (composite adverse neonatal outcomes: 5.9 [8/68] versus 9.1 percent [12/66], RR 0.64, 95% CI 0.27-1.50).

  In a subsequent randomized trial by the same investigators including 132 patients with twin pregnancies who remained undelivered 48 hours after threatened preterm labor and had a short cervix (≤20 mm), use of a pessary reduced preterm birth <34 weeks (11/67 [16.4 percent] versus 21/65 [32.3 percent] with routine care) but not before 28 or 37 weeks [44]. There was also a reduction in the number of neonates <2500 g at birth (24/134 [17.9 percent] versus 92/130 [70.8 percent], RR 0.25, 95% CI 0.15-0.43).

- In a randomized trial in Vietnam comparing the effectiveness of cervical pessary with vaginal progesterone for the prevention of preterm birth in asymptomatic patients with twin pregnancies and short cervix (≤28 mm), the pessary reduced preterm birth <34 weeks of gestation by 53 percent (21 [10/47] versus 46 [16/35] percent, RR 0.47, 95% CI 0.24-0.90) and a composite of poor perinatal outcomes by 62 percent (19 versus 50 percent, RR 0.38, 95% CI 0.12-0.47) [45]. For cervical length <38 mm, the reduction in the composite of poor perinatal outcomes was statistically significant, but the reduction in preterm birth <34 weeks was not.

Use of antenatal corticosteroids and magnesium sulfate in pregnancies at risk for preterm birth

- The dosing schedule for antenatal corticosteroids is the same for both singleton and multiple gestations believed to be at increased risk for preterm birth within seven days. Routine prophylactic administration to all twin pregnancies should be avoided and may have adverse effects [46]. (See "Antenatal corticosteroid therapy for reduction of neonatal respiratory morbidity and mortality from preterm delivery", section on 'Multiple gestation'.)

- Magnesium sulfate appears to reduce the severity and risk of cerebral palsy in infants if administered before preterm birth <32 weeks of gestation, regardless of fetal number. Dosing is the same as in singleton pregnancies. (See "Neuroprotective effects of in utero exposure to magnesium sulfate".)

PRETERM PRELABOR RUPTURE OF MEMBRANES

Prelabor rupture of membranes (PROM) typically occurs in the presenting sac but can develop in the nonpresenting twin sac, especially after invasive procedures (eg, amniocentesis, fetoscopy). Several studies have looked at perinatal outcome after preterm prelabor rupture of membranes (PPROM) in twin versus singleton gestations [47-51]. Findings included a shorter median latency period in twins (11.4 versus 19.5 hours [47]) and a higher incidence of chorioamnionitis in the nonpresenting twin in monochorionic compared with dichorionic twin pregnancies [51].

Management of PPROM and PROM is generally similar in twins and singletons. (See "Preterm prelabor rupture of membranes: Management and outcome" and "Prelabor rupture of membranes at term: Management".)

As discussed in patients with preterm labor, rarely there may be a role for delayed-interval delivery in carefully selected twin pregnancies at an early gestational age (<24 weeks) in which only the first (presenting) fetus spontaneously delivers vaginally due to PPROM. (See "Multifetal gestation: Role of delayed-interval delivery".)

GROWTH RESTRICTION AND DISCORDANCE

The management of growth restriction and/or discordance depends on chorionicity.

- **Monochorionic twins** – The goal when managing pregnancies with selective fetal growth restriction (sFGR) is to identify those that can be safely managed conservatively versus those that might benefit from fetal intervention. In a high proportion of cases, sFGR coexists with twin-twin transfusion syndrome (TTTS), twin anemia-polycythemia sequence (TAPS), or discordant fetal anomalies. Due to substantial overlap between these disorders, a systematic approach to evaluation is required to arrive at the correct diagnosis and initiate management planning. One management approach that is based on stage is shown in the algorithms (algorithm 1 and algorithm 2). Diagnosis, evaluation, and management are discussed in detail separately. (See "Selective fetal growth restriction in monochorionic twin pregnancies", section on 'Pregnancy management'.)

- **Dichorionic twins** – Growth restriction is generally managed as in singletons: determination of the cause, serial ultrasound assessment of fetal growth, ongoing evaluation of fetal well-being (biophysical profile [BPP] or nonstress test [NST] with assessment of amniotic fluid volume, and Doppler velocimetry), and timed delivery based on combination of factors (gestational age, umbilical artery Doppler, BPP score, ductus venosus Doppler, and the presence or absence of risk factors for, or signs of, uteroplacental insufficiency). Management is discussed in detail separately. (See "Fetal growth restriction: Evaluation and management".)

  In dichorionic twins, a systematic review found that the risk of fetal demise increased with increasing discordance: ≥15 percent (odds ratio [OR] 9.8, 95% CI 3.9-29.4), ≥20 percent (OR 7.0, 95% CI 4.15-11.8), ≥25 percent (OR 17.4, 95% CI 8.3-36.7), ≥30 percent (OR 22.9, 95% CI 10.2-51.6) compared with no discordance [52]. The smaller twin was at higher risk of fetal demise than the larger twin. The risk of fetal demise was not increased when the weights of the discordant twins remained appropriate for gestational age (AGA), although the small number of cases may have underestimated this association. There were several limitations of the observational studies, such as differences in definitions, populations, and use of estimated fetal weight versus birth weight, as well as lack of standardized criteria for the antenatal management. Therefore, AGA but discordant twins should still be considered at risk of adverse perinatal outcome and be followed closely.

DISCORDANT CONGENITAL ANOMALIES

The diagnosis of a congenital anomaly in one twin is especially problematic since decisions regarding monitoring, therapy, and delivery affect both fetuses. Expectant management, in utero therapy, pregnancy termination, and selective feticide should all be discussed, if appropriate for the type of abnormality and gestational age. Patients who choose to continue the pregnancy should understand how the anomalous fetus might affect the co-twin's outcome (eg, preterm birth, organ damage), including the role of chorionicity.

- **Dichorionic twins** – In dichorionic twins, selective termination of the anomalous fetus is a safe and effective option in expert hands, although there is a risk of miscarriage or preterm delivery of the co-twin. Because of these risks, expectant management may be a safer option if the twin with the anomaly is not expected to have prolonged survival or a favorable outcome (eg, trisomy 18) [53]. Anencephaly is an exception since it is associated with polyhydramnios and preterm birth. If polyhydramnios develops in the anencephalic twin's sac,

selective feticide or amniodrainage appear to result in longer gestation and higher birth weight in the nonanomalous twin than expectant management [54,55]. In our practice, we suggest selective termination whenever a fetal anomaly incompatible with survival is identified in one twin if this anomaly is associated with polyhydramnios. We recommend not performing amnioreduction unless maternal respiratory compromise is present. Timing and techniques (eg, intracardiac injection of potassium chloride) are described separately. (See "Multifetal pregnancy reduction and selective termination", section on 'Dichorionic fetuses'.)

- **Monochorionic twins** – In monochorionic twins, selective feticide can be performed but the technique is different from that in dichorionic twins and is more challenging. It necessitates obstructing one umbilical cord (eg, radiofrequency or laser ablation, bipolar coagulation, ligation) rather than intravascular injection of potassium chloride or digoxin in order to reduce risk to the co-twin associated with shared circulations [56,57]. Timing and techniques are described in more detail separately. (See "Multifetal pregnancy reduction and selective termination", section on 'Monochorionic fetuses'.)

TTTS AND TAPS AMONG MONOCHORIONIC TWINS

The three primary approaches to management of twin-twin transfusion syndrome (TTTS) are expectant management, fetoscopic laser ablation of anastomotic vessels, and amnioreduction. Selective fetal reduction is another option but rarely performed in the absence of discordant malformations or severe selective fetal growth restriction. The choice of approach depends on the stage, maternal symptoms and signs, gestational age, and availability of requisite technical expertise.

Twin anemia-polycythemia sequence (TAPS) after laser ablation has been treated with repeat laser therapy, in utero fetal transfusion, selective feticide, expectant management, and early delivery. There is no consensus regarding the optimal treatment.

Management of TTTS and TAPS are discussed in detail separately. (See "Twin-twin transfusion syndrome and twin anemia polycythemia sequence: Screening, prevalence, pathophysiology, and diagnosis" and "Twin-twin transfusion syndrome: Management and outcome".)

PREECLAMPSIA

The diagnosis, management, and course of preeclampsia/gestational hypertension are not usually affected by a multiple gestation [58], with some exceptions. A number of studies have reported that maternal uric acid concentration increases with the number of fetuses in both normotensive and preeclamptic pregnancies, with typical values of 5.2 and 6.4 mg/dL, respectively, in twin pregnancies [59-62]. In addition, case reports have described resolution of early severe preeclampsia upon death of one twin [63-65]. Thus, in such cases, expectant management is often appropriate. (See "Preeclampsia: Clinical features and diagnosis" and "Preeclampsia: Management and prognosis" and "Gestational hypertension" and "Treatment of hypertension in pregnant and postpartum women" and 'Death of one twin' above.)

OTHER COMPLICATIONS

Twin pregnancies are at risk for or at increased risk for several other complications (eg, acute fatty liver of pregnancy, nausea and vomiting of pregnancy, intrahepatic cholestasis of pregnancy, abruption, dermatoses of pregnancy, anemia, thromboembolism). These disorders are generally managed as in singleton pregnancies. (See "Twin pregnancy: Overview", section on 'Types of complications'.)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Multiple gestation".)

SUMMARY AND RECOMMENDATIONS

- **Single fetal demise** – Single fetal death after 20 weeks of gestation occurs in approximately 5 percent of twin pregnancies. Because of placental vascular anastomoses between monochorionic twins, the intrauterine death of one twin in a monochorionic twin pregnancy can cause acute hypotension, anemia, and ischemia of its co-twin, resulting in morbidity or death of the co-twin. For this reason, in monochorionic twins, if fetal assessment after approximately 26 weeks of gestation suggests impending death of one twin, we suggest prompt delivery rather than expectant management (**Grade 2C**). On the other hand, when the death of one twin has already occurred, prompt delivery of the co-twin is unlikely to be of benefit and places the survivor at risk for morbidity/mortality of preterm birth. (See 'Death of one twin' above.)

- **Preventing preterm birth** – The major source of perinatal morbidity and mortality in twin gestations is preterm birth.

  - A brief course of tocolysis in patients with acute preterm labor is reasonable to allow a course of antenatal corticosteroids. (See 'Use of tocolytics for acute preterm labor' above.)

  - Routine prophylactic use of tocolytics, cerclage, supplemental progesterone, or pessary in twin pregnancies should be avoided. None of these interventions reduce the chances of preterm birth. However, selected use of each of the interventions may be indicated in specific clinical scenarios. (See 'Overview' above.)

  - For patients with twin pregnancies with asymptomatic cervical dilation before 24 weeks, we suggest physical examination-indicated cerclage rather than expectant management (**Grade 2C**). Before performing the procedure, we suggest amniocentesis of the sac of the presenting twin or a period of several hours observation to exclude subclinical infection. Patients who decline cerclage are offered treatment with vaginal progesterone, similar to patients with a short cervix. (See 'Approach to patients with asymptomatic cervical dilation' above.)

  - For patients with twin pregnancies with asymptomatic cervical shortening and a closed cervix before 24 weeks on transvaginal ultrasound examination, we suggest vaginal progesterone therapy rather than expectant management, cerclage, or a pessary to reduce the risk of preterm birth (**Grade 2C**). Practice variability for this clinical scenario is common. Some UpToDate contributors use <20 mm as the threshold for short cervical length and others use ≤25 mm. Placement of a cerclage is an option on a case-by-case basis when the cervix is very short and the surgeon believes the cerclage can be placed safely. Some contributors of this topic use a threshold of ≤15 mm for considering cerclage and others use <20 mm. We are more likely to consider cerclage in a patient with a past history of preterm birth and vaginal progesterone in a patient with no such past history since cervical insufficiency is more likely in a patient with a past history of preterm birth. (See 'Patient selection for vaginal progesterone' above and 'Patient selection for cerclage' above and 'Role of pessary' above.)

- **Prelabor rupture of membranes** – Prelabor rupture of membranes (PROM) typically occurs in the presenting sac but can develop in the nonpresenting twin sac, especially after invasive procedures (eg, amniocentesis, fetoscopy). Management of preterm and term PROM is generally similar in twins and singletons. However, rarely there may be a role for delayed-interval delivery in carefully selected twin pregnancies at an early gestational age (<24 weeks) in which only the first (presenting) fetus spontaneously delivers vaginally due to PROM. (See 'Preterm prelabor rupture of membranes' above.)

- **Growth abnormalities** – The management of growth restriction and/or discordance depends on chorionicity.

- **Monochorionic twins** – The goal when managing monochorionic twins with selective fetal growth restriction (sFGR) is to identify those that can be safely managed conservatively versus those that might benefit from fetal intervention. In a high proportion of cases, sFGR coexists with twin-twin transfusion syndrome (TTTS), twin anemia-polycythemia sequence (TAPS), or discordant fetal anomalies. A systematic approach to evaluation is required to arrive at the correct diagnosis and initiate management planning. One management approach that is based on stage is shown in the algorithms (algorithm 1 and algorithm 2). (See 'Growth restriction and discordance' above.)

- **Dichorionic twins** – Growth restriction in dichorionic twins is generally managed as in singletons: determination of the cause, serial ultrasound assessment of fetal growth, ongoing evaluation of fetal well-being (biophysical profile [BPP] or nonstress test [NST] with assessment of amniotic fluid volume, and Doppler velocimetry), and timed delivery based on combination of factors (gestational age, umbilical artery Doppler, BPP score, ductus venosus Doppler, and the presence or absence of risk factors for, or signs of, uteroplacental insufficiency). (See 'Growth restriction and discordance' above.)

- **Discordant congenital anomalies** – The management of discordant congenital anomalies depends on chorionicity. (See 'Discordant congenital anomalies' above.)

  - **Monochorionic twins** – In monochorionic twins, selective feticide can be performed but necessitates obstructing one umbilical cord (eg, radiofrequency or laser ablation, bipolar coagulation, ligation) rather than intravascular injection since the latter places the co-twin at risk due to the shared circulation.

  - **Dichorionic twins** – In dichorionic twins, selective termination of the anomalous fetus using intravascular injection (eg, intracardiac injection of potassium chloride) is a safe and effective option in expert hands, although there is a risk of miscarriage or preterm delivery of the co-twin.

- **Twin-twin transfusion syndrome and twin anemia-polycythemia sequence** – The three primary approaches to management of TTTS are expectant management, fetoscopic laser ablation of anastomotic vessels, and amnioreduction. The choice depends on the stage, maternal symptoms and signs, gestational age, and availability of requisite technical expertise. TAPS after laser ablation has been treated with repeat laser therapy, in utero fetal transfusion, selective feticide, expectant management, and early delivery. There is no consensus regarding the optimal treatment. (See 'TTTS and TAPS among monochorionic twins' above.)

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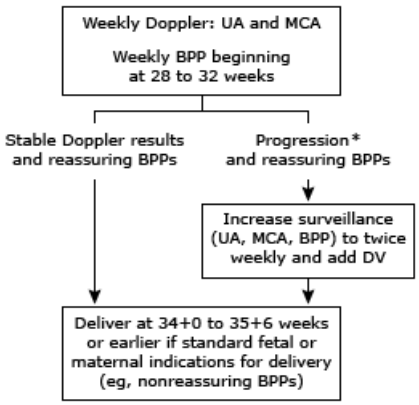
Topic 131147 Version 8.0

GRAPHICS

Pregnancy management after diagnosis of type 1 sFGR

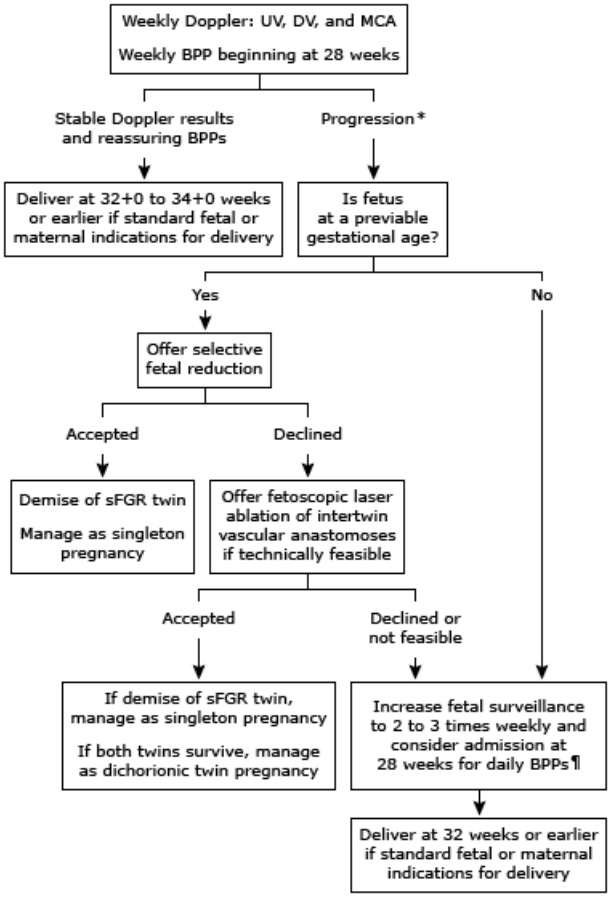


Type 1 sFGR is defined by persistently forward flow on UA Doppler. Fetuses with nonreassuring BPPs are generally delivered.

sFGR: selective fetal growth restriction; UA: umbilical artery; MCA: middle cerebral artery; BPP: biophysical profile (including nonstress test); DV: ductus venosus; PI: pulsatility index.
* Doppler results indicating worsening disease warranting more frequent fetal surveillance include UA PI >95th percentile, MCA PI <5th percentile, or progression to type 2 or 3 sFGR.

Graphic 122835 Version 2.0

Pregnancy management after diagnosis of type 2 and type 3 sFGR



Type 2 sFGR is characterized by fixed absent or fixed reversed UA end-diastolic velocity without variation of the waveform in the smaller twin; type 3 sFGR is characterized by variable flow pattern that cycles between forward, absent, and reversed flow over a short interval (ie, intermittent absent/reversed end-diastolic flow).

sFGR: selective fetal growth restriction; UV: umbilical vein; DV: ductus venosus; MCA: middle cerebral artery; BPP: biophysical profile; UA: umbilical artery; PI: pulsatility index; NST: nonstress test.

* Signs of worsening disease include progression from type 2 to type 3 sFGR, DV PI >95th percentile, development of absent or reversed a-wave in the DV waveform, and oligohydramnios in the sac of the smaller twin.

¶ Consider admission for daily NSTs if delivery for fetal indications would be considered.

Graphic 122836 Version 2.0

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