Dating of Twin Pregnancies

Pierre Macé, Houman Mahallati, and Laurent J. Salomon

Contents

A. Khalil et al. (eds.), *Twin and Higher-order Pregnancies*,
https://doi.org/10.1007/978-3-030-47652-6_5

5

Trailer

Dating of the pregnancy is one of the main aims of first trimester ultrasound in twin pregnancies. The main objective of dating in multiple pregnancies is to make ultrasound examinations later in pregnancy more effective in the screening and management of complications either specific or more frequent in these pregnancies. The dating of twin pregnancies should ideally be based on that of singletons and should be performed when the crown-rump length (CRL) measurement is between 45 and 84 mm (i.e., 11 + 0 to 13 + 6 weeks of gestation) using the same reference charts, at the time of the routine first trimester ultrasound scan. If the woman presents after 14 weeks of GA and with a CRL measurement above 84 mm, the dating of pregnancy should be based on the head circumference measurement. One of the recurrent questions is the choice of the fetus upon which to base dating, especially when there is a significant difference between the sizes of the two twins. The recent ISUOG guidelines on the role of ultrasound in twin pregnancies have outlined the most common practice: the larger CRL should be used for pregnancy dating as it may protect against overlooking the diagnosis of a subsequent selective IUGR of the smaller twin. As is the case for singleton pregnancies, twin pregnancies conceived via ART should be dated using the oocyte retrieval date or the embryonic age from fertilization.

Definitions

ART: Assisted reproductive technologies
CRL: Crown-rump length
GA: Gestational age
sIUGR: Selective intra-uterine growth restriction
TTTS: Twin-to-twin transfusion syndrome

Learning Objectives

After reading this chapter, the reader should know the following:

- How to date a twin pregnancy
- How to date a twin pregnancy conceived via ART
- What is considered the significant threshold for CRL measurement discrepancy
- How to deal with a significant discrepancy in CRL measurements

5.1 Introduction

In addition to determining chorionicity and amnionicity, and screening for aneuploidies and structural defects, dating of the pregnancy is one of the important goals of ultrasound in twin pregnancies, especially when exams are done in the first trimester.

The primary purpose of dating in twin pregnancies is not entirely the same as with that of singletons, in which the estimation of a due date is not as relevant in the context of multiple pregnancies as most deliveries take place before 40 weeks of gestation, either spontaneously or due to a medical indication.

The main objective of dating in multiple pregnancies is therefore rather to make subsequent ultrasound examinations at later term more effective in the screening and management of complications either specific to twin pregnancies (TTTS or selective intra-uterine growth restriction (IUGR)) or more frequent in these pregnancies (IUGR, structural defects, and aneuploidies).

One of the recurrent questions is therefore the choice of the fetus upon which to base dating, especially when there is a significant difference between the size of the two twins. This must be done in a manner as to not ignore these potential complications and at the same time not generate unnecessary parental anxiety or result in further unnecessary investigations.

5.2 When and How to Date Twin Pregnancies?

Routine dating of pregnancy from a measurement of the crown-rump length (CRL) at the time of first trimester ultrasound has been shown to be superior to the use of menstrual dates or dating after 14 weeks of GA [1] and

should therefore be used in singleton pregnancies [2]. It is likely that the same should apply in twins, although there have been no specific studies demonstrating that it performs better than last menstrual period. The question is therefore whether the CRL reference charts used in singletons can also be used in twin pregnancies.

The dating of twin pregnancies should ideally be based on that of singletons and should be performed when the crown-rump length (CRL) measurement is between 45 and 84 mm (i.e., 11 + 0 to 13 + 6 weeks of gestation) [3, 4] using the same reference charts, at the time of the routine first trimester examination (■ Fig. 5.1).

Indeed, a study by Dias et al. [4] compared the dating of twin and singleton pregnancies (controls) conceived following assisted reproductive technologies (ART) by measuring the CRL (*Robinson charts*) [5] and compared with the known date of conception. They showed that the variation in CRL between singleton and twins was unlikely to be clinically relevant, with a maximum variation of about 2 mm, or 1 day of gestational age (GA), well within the first trimester ultrasound accuracy range for dating pregnancy, and probably consistent with normal physiological variation .

If the woman presents after 14 weeks of GA and with a CRL measurement above 84 mm, the dating of pregnancy should be based on the head circumference measurement [2, 3], which appeared to produce the most reliable prediction, even based on most recent predictive reference charts [6].

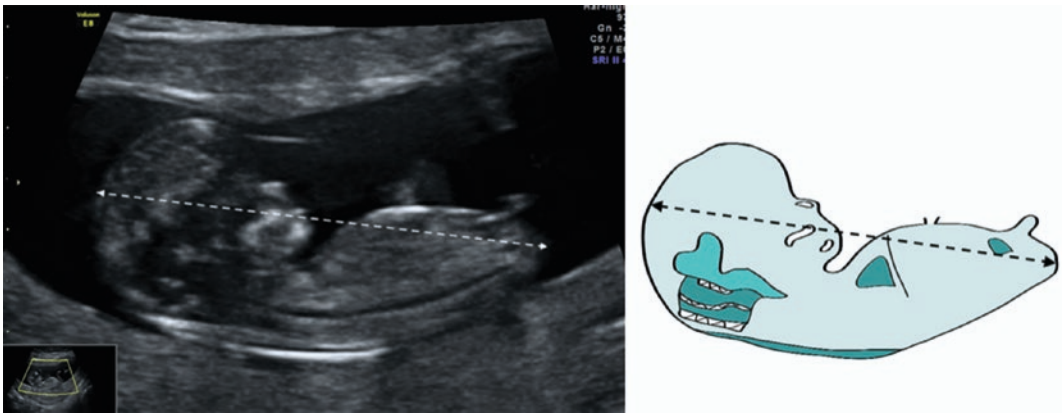
As for singleton pregnancies, twin pregnancies conceived via ART should be dated using the oocyte retrieval date or the embryonic age from fertilization [3].

5.3 The Choice of the Fetus Upon Which to Base Dating

While it is likely that dating in the first trimester is desirable, there is less consensus on whether pregnancy should be dated on measurements taken on the smallest twin, the largest twin, or on the mean measurements of the two twins [3, 4, 7, 8].

Theoretically, the choice of the smallest twin has the advantage of not creating unnecessary parental anxiety about possible growth restriction as early as the first trimester. The exception to this would be cases with significant and obviously pathological CRL discordances (see below). There are three potential disadvantages to this strategy: (1) ignoring a potential growth restriction in the small fetus that appears to be growing appropriately and is "appropriate" for gestational age due to the "a priori" designation of dates based on that smaller fetus, (2) the potential to incorrectly assume there is fetal macrosomia of the larger twin at a later term, and (3) the risk of neglecting a post-term twin pregnancy.

These risks and the relative infrequency of large-for gestational age fetus in twin pregnancies explain the common practice of dating the pregnancy based on the larger twin.



■ **Fig. 5.1** Crown-rump length measurement, left: ultrasound view, right: schematic view

In this situation, the choice is effectively that of increasing the sensitivity of screening for selective growth restriction, while recognizing the increased risk of a higher number of false positives and potentially unnecessary testing and parental anxiety.

The choice could therefore be based on the most accurate measurement in this context, but unfortunately the literature is inconsistent as to what constitutes the most accurate measurement, with several authors finding a higher performance of either the smallest CRL [7, 9], or the mean of the two measurement [4], while the largest CRL often leads to the greatest difference with the assumed (assisted reproductive technologies) date of pregnancy.

However, all this must be put into perspective.

Given that CRL discordance in twin pregnancies is rare (less than 10% of twins have a discordance of more than 10% [7, 10], the mean discrepancy between twins at the time of first trimester ultrasound would therefore be expected to be very low.

In a prospective study including 182 twin pregnancies, Salomon et al. [7] showed that the mean difference in the CRL measurement between the two twins was 3.4 mm, or 1.2 days of GA. This was supported in a large retrospective study on 6225 twin pregnancies [10], which stated that the mean difference in the CRL measurement was 3.2 mm in dichorionic pregnancies and 3.6 mm in monochorionic diamniotic pregnancies (statistically significant difference). In this sense, using the formula reported by Robinson et al. [5], a 3 mm difference in CRL measurements is at most equivalent to a difference of 2 days of GA. As mentioned later, this difference may simply reflect different growth patterns and/or measurement errors of two normal fetuses and is well below the measurement error reported for CRL assessment. It is therefore unlikely to have a significant impact on subsequent pregnancy follow-up.

The situation is different in the presence of a major discrepancy between CRL measurements. Several different cut-offs of significant CRL discrepancy have been proposed, which is itself a concern as the association between CRL discordance and adverse outcomes is highly dependent on the threshold adopted. It is therefore important to set a threshold to define a significant discrepancy that could impact the pregnancy outcome. The ≥10 mm or 15% CRL discordance is the most commonly used to represent the higher centiles of discordance and the 95th percentile for CRL discrepancy seems to be around 10 mm, which is a 14% difference in CRL measurement or 3.6 days of GA [7].

Again, according to Robinson et al. [5], a 10 mm difference is equivalent to a difference of between 4 and 6 days of GA depending on the GA at the time of measurement.

Above these limits, the dating of the pregnancy should definitely be based on the larger twin's CRL, as this major discrepancy probably indicates a very early-onset growth restriction of the smallest twin which may have the same significance as in a singleton pregnancy and reveal a chromosomal defect [7] or structural abnormalities. However, it is to be noted that the role of CRL discordance in screening for aneuploidy is probably limited with the introduction of non-invasive prenatal testing.

A significant CRL discordance has also been reported as an early predictor of adverse pregnancy outcomes such as significant birth weight discrepancy [11], selective IUGR, fetal loss before 20 or 24 weeks of gestation, preterm birth [10, 12], fetal loss after 24 weeks of gestation [12] or with a moderate strength of association, TTTS in monochorionic twins [10, 13–15] despite a too poor prediction accuracy to form a clinically relevant screening test for these adverse outcomes [10, 12].

In cases of pregnancy conceived either spontaneously or via ART, every significant discrepancy between the two twins (>10 mm, >15%) should lead to additional investigations of the smallest twin, which is the twin at higher risk of aneuploidy or IUGR, and closer follow-up of the pregnancy should be instituted. This is despite the poor screening performance for adverse pregnancy outcomes

as stated above. An additional earlier scan, at 14 weeks of GA for monochorionic pregnancies and 16 weeks of GA for dichorionic pregnancies, should still be offered. With regard to the risk of aneuploidy, future research should investigate the relevance of major CRL discrepancy in the era of cfDNA testing.

In the vast majority of twin pregnancies for which the discordance is less than 15% (i.e., in practice less than 7–12 mm), the question of which twin to date remains thus debatable.

While the smaller twin, which appears closer to the actual age in ART-conceived pregnancies [7, 9], could be used for dating, this will decrease the IUGR detection rate later in pregnancy. The use of the average CRL will reduce the random error of the measurements. Finally, the use of the larger twin allows for a simple and consistent practice, since it applies even in the case of a major discrepancy related to aneuploidy or structural defects of the smaller one, and increases the sensitivity of subsequent selective-IUGR screening. This recommendation has also recently been stated in the ISUOG guidelines on the role of ultrasound in twin pregnancies [3] and is likely to ensure, through its simplicity, a much-needed standardization of practices. To add emphasis, such a recommendation can be applied in all cases, regardless of the discrepancy in CRL between the twins.

If the woman presents after 14 weeks of GA, the larger head circumference should be used for dating pregnancy.

The flow chart summarizes the management options for the dating of twin pregnancies (Fig. 5.2).

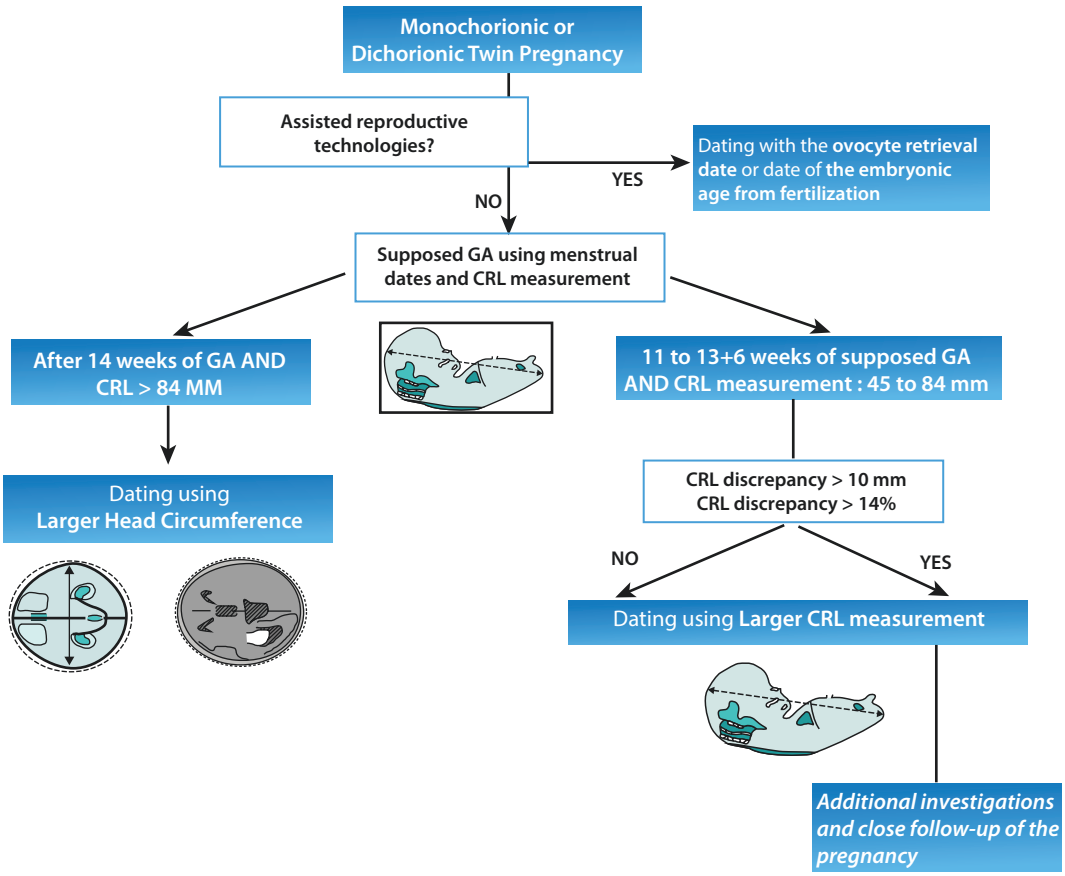


Fig. 5.2 Management flow chart for dating of twin pregnancies

5

Key Points

1. Dating of the pregnancy is one of the main objective of first trimester ultrasound in twin pregnancies.
2. Due to a usually earlier delivery date, the main objective of dating pregnancy is to increase the screening of twin pregnancy complications, especially selective intra-uterine growth restriction.
3. The dating of twin pregnancies should be based on that of singletons and be performed when the crown-rump length (CRL) measurement is between 45 and 84 mm (i.e., 11 + 0 to 13 + 6 weeks of gestation) using the same reference charts.
4. The mean discrepancy between twins at the time of first trimester ultrasound appears to be clinically irrelevant, and unlikely to have a significant impact on subsequent pregnancy follow-up.
5. Dating of pregnancy using the largest CRL measurement, as advised by ISUOG guidelines, is the most common practice and allows high sensitivity for the screening of selective intra-uterine growth restriction.
6. If the CRL measurement discrepancy is >10 mm or >15%, additional investigation should be conducted on the smallest twin which is at high risk of aneuploidy or IUGR.
7. Twin pregnancies conceived via ART should be dated using the oocyte retrieval date or the embryonic age from fertilization.
8. After 14 weeks of GA or if the CRL measurement is above 84 mm, the larger head circumference should be used for dating pregnancy.

5.3.1 Review Questions

1. What do twin and singleton pregnancies have in common in terms of pregnancy dating?

2. What are the rationales for using the CRL measurement of the largest twin for dating twin pregnancies?

3. What are the possible causes of CRL measurement discrepancy between twins during the first trimester?

4. What follow-up and monitoring should be planned if there is a significant CRL discordance between the twins during the first trimester ultrasound?

5.3.2 Multiple-Choice Questions

1. About dating in twin pregnancies, the most common practice is:
   (a) To date using the smallest CRL measurement
   (b) To date using the mean CRL measurement
   (c) To date using the largest CRL measurement except for pregnancy conceived via ART
   (d) To use "specific twin-pregnancy" reference charts for CRL measurement
   (e) To date using the larger head circumference if the woman presents after 14 weeks of GA

Answer: (c, e)

2. In cases of discrepancy between CRL measurements of twins during the first trimester examination
   (a) The threshold of significance is likely to be 10 mm or 14%.
   (b) In cases of significant discrepancy, dating should be based upon the smallest twin.
   (c) A significant discrepancy should lead to a closer follow up of the pregnancy.
   (d) Most of CRL measurement discrepancies are unlikely to have significant clinical impact.
   (e) Whatever the discrepancy, twin pregnancies conceived via ART should be dated using the oocyte retrieval date or the embryonic age from fertilization.

Answer: (a, c, d, e)

References

1. Whitworth M, Bricker L, Mullan C. Ultrasound for fetal assessment in early pregnancy. Cochrane Pregnancy and Childbirth Group, editor. Cochrane Database of Systematic Reviews [Internet]. 2015 Jul 14 [cited 2019 Apr 11]; Available from: http://doi.wiley.com/10.1002/14651858.CD007058.pub3.
2. ISUOG. Practice guidelines: performance of first-trimester fetal ultrasound scan: ISUOG guidelines. Ultrasound Obstet Gynecol. 2013;41(1):102–13.
3. Khalil A, Rodgers M, Baschat A, Bhide A, Gratacos E, Hecher K, et al. ISUOG practice guidelines: role of ultrasound in twin pregnancy. Ultrasound Obstet Gynecol. 2016;47(2):247–63.
4. Dias T, Mahsud-Dornan S, Thilaganathan B, Papageorghiou A, Bhide A. First-trimester ultrasound dating of twin pregnancy: are singleton charts reliable? BJOG Int J Obstet Gynaecol. 2010;117(8):979–84.
5. Robinson HP, Fleming JEE. A critical evaluation of sonar "crown-rump length" measurements. Br J Obstet Gynaecol. 1975;82(9):702–10.
6. Papageorghiou AT, Kemp B, Stones W, Ohuma EO, Kennedy SH, Purwar M, et al. Ultrasound-based gestational-age estimation in late pregnancy. Ultrasound Obstet Gynecol. 2016;48(6):719–26.
7. Salomon LJ, Cavicchioni O, Bernard JP, Duyme M, Ville Y. Growth discrepancy in twins in the first trimester of pregnancy. Ultrasound Obstet Gynecol. 2005;26(5):512–6.
8. Sebire NJ, D'Ercole C, Soares W, Nayar R, Nicolaides KH. Intertwin disparity in fetal size in monochorionic and dichorionic pregnancies. Obstet Gynecol. 1998;91(1):82–5.
9. Chaudhuri K, Su L-L, Wong P-C, Chan Y-H, Choolani MA, Chia D, et al. Determination of gestational age in twin pregnancy: which fetal crown-rump length should be used?: gestational dating in twins. J Obstet Gynaecol Res. 2013;39(4):761–5.
10. Litwinska E, Syngelaki A, Cimpoca B, Sapantzoglou I, Nicolaides KH. Intertwin discordance in fetal size at 11–13 weeks' gestation and pregnancy outcome. Ultrasound in Obstetrics & Gynecology [Internet]. 2019 Nov 11 [cited 2019 Nov 28]; Available from: https://obgyn-onlinelibrary-wiley-com.lama.univ-amu.fr/doi/10.1002/uog.21923.
11. Kalish RB, Chasen ST, Gupta M, Sharma G, Perni SC, Chervenak FA. First trimester prediction of growth discordance in twin gestations. Am J Obstet Gynecol. 2003;189(3):706–9.
12. D'Antonio F, Khalil A, Pagani G, Papageorghiou AT, Bhide A, Thilaganathan B. Crown–rump length discordance and adverse perinatal outcome in twin pregnancies: systematic review and meta-analysis. Ultrasound Obstet Gynecol. 2014;44(2):138–46.
13. Mackie FL, Hall MJ, Morris RK, Kilby MD. Early prognostic factors of outcomes in monochorionic twin pregnancy: systematic review and meta-analysis. Am J Obstet Gynecol. 2018;219(5):436–46.
14. Stagnati V, Zanardini C, Fichera A, Pagani G, Quintero RA, Bellocco R, et al. Early prediction of twin-to-twin transfusion syndrome: systematic review and meta-analysis: early prediction of TTTS. Ultrasound Obstet Gynecol. 2017;49(5):573–82.
15. Memmo A, Dias T, Mahsud-Dornan S, Papageorghiou AT, Bhide A, Thilaganathan B. Prediction of selective fetal growth restriction and twin-to-twin transfusion syndrome in monochorionic twins. BJOG Int J Obstet Gynaecol. 2012;119(4):417–21.

Key Reading

Khalil A, Rodgers M, Baschat A, Bhide A, Gratacos E, Hecher K, et al. ISUOG practice guidelines: role of ultrasound in twin pregnancy. Ultrasound Obstet Gynecol. 2016;47(2):247–63.