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Intrauterine growth in twin pregnancies

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Introduction

Multiple pregnancies have always been the subject of intense medical and social interest, representing a unique opportunity for determining the relative contributions of genetic and environmental influences upon human growth and development.

Birth statistics for the year 2003 show that the multiple birth rate in England & Wales is 1.5% of all maternities. In the past two decades it has increased by 50% in England and Wales (1) and by 74% in the United States (2). Although one-fourth of this is due to child bearing among women of older ages, three-fourths is due to infertility treatments and assisted reproductive techniques (3). The combined effects of congenital anomalies, premature deliveries, maternal antenatal complications and low birth weight ensures that the perinatal mortality for multiple pregnancies remains considerably higher than that of singletons despite advances in perinatal care. Preterm delivery and intrauterine growth restriction are the leading causes of poor outcome in twin pregnancies (4). There is a larger increase across weight categories for a given gestational age than across gestational ages for a given birth weight (5). Twins are almost 10 times more likely than singleton to have a low birth weight (< 2500 g or < 1500 g) and their mean birth weight is approximately 1000 g less than that of singletons (2400 compared with 3400 g). This weight difference compared with singletons caused by slower growth and by birth at earlier gestations in approximately equal measures. Controlled for gestational age, twins weigh approximately 500 g less at term. Hence accurate prenatal assessment of the size of twins is essential in preventing perinatal death. There is a need for greater understanding of twin pathophysiology, including growth, and adoption of effective management strategies.

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Twins and lenght of pregnancy

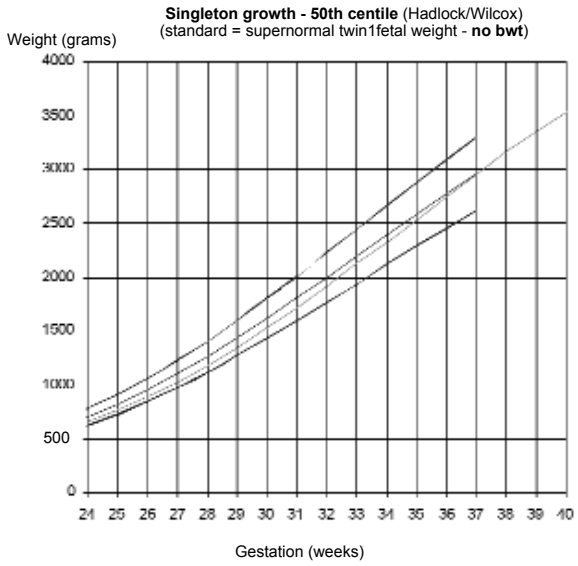
The study of fetal growth in twins needs to include a consideration of the expected length of pregnancy. Twins are born on average 3 weeks earlier than singletons. The typical (modal) length of gestation for twins is 37 weeks, for spontaneous as well as induced deliveries (5). Thus, if one uses the singleton definition for premature birth (<37 weeks), half of all twin births are premature. For triplets, the typical length of gestation is another 3 weeks earlier (i.e., approximately 34 weeks).

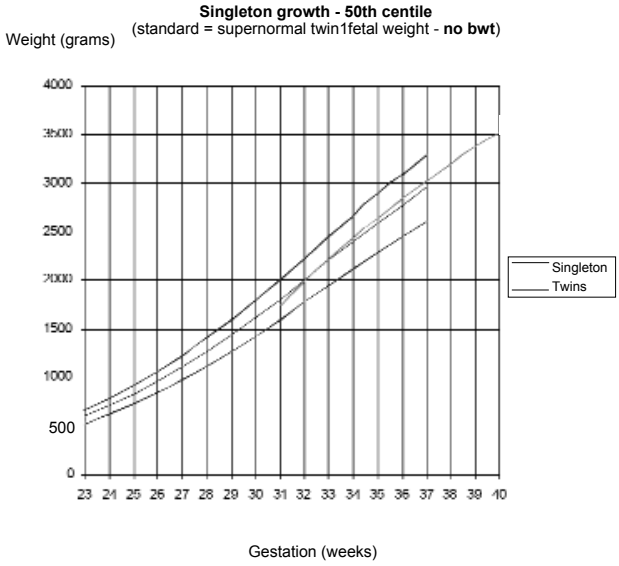
The lowest perinatal mortality rate for twins is at 37 weeks1 (6, 7, 8, 9), (i.e., 3 weeks earlier than for singletons) and there is evidence that lung maturation in twins also occurs earlier than in singletons (10).

Considerations of normal gestation length are important than when counseling a mother at the beginning of pregnancy, as Naegele's rule for determining the expected date of confinement does not apply in multifetal pregnancy. It is also relevant when determining a date for elective delivery by cesarean section, if this is indicated. If a date is set for 38 to 39 weeks, as is customary for singletons, then most twin pregnancies would have already commenced spontaneous labour at this gestational age, and a planned elective procedure is more likely to become an emergency procedure with its attendant increased risks. Based on these considerations, the optimum time to plan an elective cesarean section in twins is at about 37 weeks for sure dates based on an early dating scan.

Intrauterine growth of twins compared with singletons

The pattern of fetal growth in twin gestation has not yet been clearly characterised. Adequate measurement of prenatal growth of twins by using a standard growth curve for singletons is still controversial. Studies have indicated that the pattern of intrauterine growth for multiple births differs from





that of singletons, although the point of differentiation has varied (11, 12). Naeye et al. (13, 14) suggested that intrauterine growth of twins did not parallel singleton growth. Extrapolating from live-born twin birthweight data, they concluded that the weight of twins is similar to that of singletons until the 30th week of gestation, at which time twin weight gain decreases throughout the rest of third trimester. By term, weights of twins are on an average 10% lower than those of singletons (13). Using necropsy data, they also showed a fall-off in weight at about 30 weeks of gestation in twin fetal organs, including the heart, lungs, kidneys, liver, spleen, adrenal glands and brain (14). Interestingly, the only anthropomorphic parameter that remained at the singleton mean level throughout gestation was fetal body length (13). Daw and Walker (15), again using birthweight data of live born twins found that after about 30 weeks gestation, the total fetal weight gain in a twin pregnancy was similar to the total singleton weight gain, resulting therefore in diminished weight gain in each twin fetus in the latter part of the third trimester.

Biparietal diameter (BPD) has been the most widely studied growth parameter in twins (16, 17, 18). Some investigators have found smaller BPDs in twin gestation at all gestational ages (17, 18), while others have found a decrease in twin BPD growth only during the third trimester (19). Very limited investigations have been performed of other growth parameters, such as femur length (FL) and abdominal circumference (AC). Grumbach et al. (19) studied the growth pattern of BPD, FL and AC in 103 twin pregnancies and compared them to singletons, showing a decrease of BPD growth after 31 to 32 weeks of gestation relative to singletons. Twin AC growth rate decreases after 32-33 weeks of gestation relative to singletons, but the twin FL growth pattern does not deviate from that of a singleton. The recent study by Ong et al. (20) showed that the growth of AC for twins appear to follow closely that for singletons until 32 weeks; thereafter, there is a gradual but definite fall off in growth compared to the singleton standard. The pattern of growth of FL is largely similar to that of singletons, however from mid to early third trimester, the BPD of twin babies was larger than that of singletons. Abdominal circumference growth and weight gain were suggested to be slower in multifetal pregnancies (21). However, these studies tended to average growth in all pregnancies rather than define a normal standard.

Several growth curves have been developed (20, 22), showing that growth of twins deviates from that of singletons. The use of such charts assumes that deviation of twin weight from singleton is normal and not pathological, which has not yet been proven. Other studies have suggested that the growth is similar (23, 24, 25). The potential danger is that a chart expecting a slower growth trajectory will not highlight if there is a pathological problem with fetal growth.

Normal growth in twins

To study the normal trajectory of expected weight gain in twin pregnancy, we examined a dataset of 105 consecutive, normal-outcome twin pregnancies which all had early ultrasonographic dates.

Normal outcome was defined as pregnancies reaching at least 34 weeks of gestation, spontaneous onset of labour, and inter-twin weight discordance at birth of less than 15%. Serial ultrasonographic estimations of fetal weight in twin A were curve fitted according to a previously described technique (17).

The figure shows the resultant curves for the median, 90th and 10th percentiles of optimal fetal growth for twins. As can be seen, there is continued weight gain and minimal flattening towards the end of pregnancy. However the curve ended at 37 weeks, as there was little data to allow reliable averaging at later gestations.

This curve was compared with that for singletons derived by Hadlock (26) and showed that the slope of both curves was similar up to 37 weeks. This suggests that, up to their respective normal gestation lengths, singletons and twins had similar weight gain. However more twins which continued until later gestations had lower birthweights, suggesting that a slowing of growth tends to set in after the optimal length of gestation is reached. This may explain why growth charts based on birthweights (rather than longitudinal ultrasound measurements) show a flattening of the curve at term.

These observations may also suggest that the shorter average length of gestation in twin pregnancy is an adaptive response to growth exceeding placental function (27), which has implications for monitoring and management.

Monitoring growth

Prenatal recognition of deviation from normal growth is an important prerequisite to reducing prenatal morbidity and mortality. Assessment of fetal growth is crucial in twin gestations, since the information gained often has an impact on pregnancy management. Twin gestations have greater fundal heights and larger intrauterine volumes than singleton gestations. Fundal height measurements may assess abdominal girth and detect rapid increases associated with hydramnios, but by themselves are not indicative of fetal growth.

The slowing of growth is predominantly a third trimester phenomenon (28). The standard method of surveillance is by regular ultrasonographic scan. Various policies exist for serial scanning, but they should be done at least every 4 weeks and preferably every 2-3 weeks in the 3rd trimester. The most sensitive measurements for detecting growth disturbances are fetal abdominal circumference and fetal weight assessment based on abdominal circumference, femur length and head circumference.

Reports on the accuracy of weight prediction in twin pregnancies are mixed. Several studies suggest that the errors are larger in twins than in singletons (29), whereas others have maintained that with appropriate methods and formulas, the range of error is similar (30). There is evidence however that the detection of intertwin discordance is often inaccurate (31), this may be related to problems with measuring abdominal circumference in a crowded intrauterine environment, oligohydramnios and/or malposition. The predominant cause of growth restriction in twins, as in singletons, is placental failure. Intertwin disparities exist in monochorionic and dichorionic twins. As most twin pregnancies are dichorionic, intertwin disparities are more likely to be caused by fetal growth restriction than by intertwin transfusion (32). Even in monochorionic twins who have weight discordance at birth, the smaller twin has polycythemia in only a third of cases, suggesting that the cause of discordance is more often uteroplacental dysfunction rather than twin-twin transfusion. Surveillance of a fetus with slow growth requires further investigation, including Doppler velocimetry to establish the optimum time for delivery.

Conclusion

Twin growth is different from that of singletons in that it has a shorter normal length of pregnancy, with a modal length of 37 weeks. Up to this gestation, normal fetal weight gain is similar to that of singleton fetuses, and can be assessed using the same growth charts. However, twins are more likely to develop fetal growth restriction associated with placental insufficiency or twin-twin transfusion, and should be monitored with serial ultrasound biometry throughout the third trimester.

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