Gestational Dating Determining Gestational Age & Gestational Age in Case Management

Violet Stephens | August 3 2010



Determining Gestational Age

TECHNIQUES FOR ACCURATE DATING



Gestational age is the age of an embryo or fetus (or newborn infant).

Cultural Discrepancies in Dating Pregnancy and Gestational Age

In humans, the most common method of calculating gestational age in developed countries is commonly referred to as Naegle's Method. This method starts by counting either from the first day of the woman's last menstrual period (LMP) or from 14 days before conception (fertilization). Counting from the first day of the LMP involves the assumption that conception occurred 14 days later. If the day of conception is known, the 14th day before conception is used in place of the LMP. So this method adds about 14 days to the actual age of the fetus or embryo.

This method of dating is originally from an era when physicians and midwives lacked precise understanding of the physiology of conception and early human development.

With the advent of ultrasound technology and prenatal video technology in the last few decades, not only can we accurately ascertain gestational age, we can witness the very moment of conception. Since so many aspects of obstetrical education are built upon Naegle's method of dating, rather than making the correction, medical schools generally make the distinction between "gestational age" (actual fetal age) and "weeks of pregnancy" (2 weeks in advance of actual fetal age)[1].

Some cultures count age from conception. This method of counting is also known as fertilization age, embryonic age, conceptional age, gestational age, or (intrauterine) developmental (IUD) age. These terms are more prevalent in descriptions of prenatal development of the embryo or fetus. In contrast, the term 'weeks of pregnancy' (measured from LMP) are generally referenced in descriptions of obstetrical physiology and maternity care.

Additionally, a new definition adopted by ACOG in 1965 [2] officially redefined pregnancy as beginning with implantation, which would theoretically be about three weeks after the LMP, or one week after conception. This also redefined the term 'conception' to mean 'the implantation of the embryo'. This usage is generally reserved for pharmacological references.

Methods of Determining Gestational Age

Naegle's Rule - The Estimated Due Date (EDD) is calculated by counting back three months from the LMP and adding seven days. This method assumes the patient has a 28-day menstrual cycle with fertilization occurring on day 14. Inaccuracy occurs because many women do not have regular 28-day cycles or conceive on day 14. In addition, early pregnancy bleeding or recent use of hormonal contraceptives may lead to an incorrect assumption of the date of the last menses. Research supporting the accuracy of this method is highly controversial.

Mittendorf's Rule - Begin with the starting date of the LMP. Add 15 days for first time Caucasian mom, or add 10 days if the patient is non-white or this is not her first baby. Then subtract 3 months. This method has similar drawbacks to Naegle's rule, but research[3] shows that in uninduced labors, is it significantly more accurate for determining spontaneous onset of labor.

Bimanual Exam - Bimanual examination can be used to estimate first trimester uterine size and thereby assess gestational age. The accuracy of this is generally considered to be +/- two weeks because uterine size is affected by fibroids, uterine malposition (i.e., retroverted uterus), multiple gestation, and maternal obesity. [4]

Ultrasound - Ultrasonography can be used to visualize the ovulation of an ovum from the ovary, thereby accurately assessing gestational age within 24 hours of conception. This is the most accurate method of determining gestational age. Due to the invasive nature of this methodology, it is not commonly used, except in cases of assisted reproduction. More commonly used to determine gestational age is biometric dating in which data collected from ultrasound measurements of fetal crown-rump length, femur length, head circumference, abdominal circumference, and biparietal diameter to assess gestational age. Between 5-11 weeks, accuracy is approximately 5 days +/- .[5] After 18 weeks of gestation, ultrasound imaging may be accurate to +/- 2-3 weeks.

Serum &-hCG Testing - Mean serum human chorionic gonadotropin (hCG) levels have been shown to be highly correlated with gestational age during early pregnancy. If pregnancy has occurred, &-hCG can be detected as early as eight days after the luteinizing hormone (LH) surge. The &-hCG concentration in a normal intrauterine pregnancy rises in a curvilinear fashion during the first six weeks of pregnancy at which time it plateaus at approximately 100,000 IU/L. The mean doubling time for the hormone is from 1.4 to 2.1 days. The ß-hCG concentration rises at a much slower rate in most, but not all, ectopic and nonviable intrauterine pregnancies.

Charting Method - The EDD is calculated by counting 266 days from the day of ovulation as determined by basal body temperatures recorded on fertility charts. This method is the most accurate non invasive method of dating, with about a 98%-99% rate of accuracy for correct gestational age +/- 3 days.

Early HPT Method - Using home pregnancy tests (HPTs) to confirm and date pregnancy can be accurate in combination with charting. This requires utilizing HPTs daily starting around 7 days following suspected ovulation. Regular HPTs will pick up small levels of HCG beginning on the 9th or 10th day after conception, resulting in a faint colored line. With high sensitivity tests, colored lines first appear 7 to 8 days after conception. Accuracy of this method has not been adequately researched.

Other methods that are used to verify or confirm gestational age, but are not typically relied upon as primary methods of determining gestational age include:

Magnetic Resonance Spectroscopy - (MRS) of amniotic fluid samples, coupled with statistical modeling, can determine gestational age in the late second and third trimesters within +/- two weeks.

Fundal Height - Fundal height typically corresponds in centimeters to pregnancy date in weeks. For example, typical fundal height at 33 weeks is also 33 centimeters from the pubic bone. This is widely accepted as being accurate to within +/- 2-3 weeks.

Fetal Movement - Fetal movement is generally believed to first be felt by the mother around 16-18 weeks. However some women report fetal movement as early as the first trimester, while others feel nothing until the third trimester. Thus, reliability is subjective for determining gestational age.

Heart Tones - Heart tones are generally initially audible at 8-10 weeks with an ultrasonic doppler using a 3 MHZ probe, or at 9-11 weeks with a 2 MHZ probe. A stethoscope can pick up heart tones between 18-20 weeks.

Gestational Age in Case Management

USING GESTATIONAL AGE TO OPTIMIZE PERINATAL OUTCOMES

Accurate gestational dating is essential to providing optimal care to birthing women.

Numerous conditions and complications can be identified and more appropriately managed because accurate gestational age has been established. Some common conditions for which diagnosis may be aided due to well established gestational age include:

Ectopic pregnancy - A provider may be alerted to a case of ectopic pregnancy in the presence of symptoms coinciding with a known gestational age of 5-8 weeks. Additionally, such a possibility can be eliminated if the known gestational age is beyond 10 weeks.

Fetal loss - In pregnancies where fetal loss is suspected, cross referencing a known gestational age of at least 8 weeks with absence of fetal heart tones using ultrasound technology can accurately confirm such cases.

Fetal anomalies - Numerous fetal anomalies can be detected when known gestational age is combined with diagnostic tests that have established abnormal result ranges.

Uterine anomalies - Providers can be alerted to maternal uterine anomalies such as septate, bicornuate, or didelphyc uteri, when known gestational age does not concur with bimanual examination or fundal height.

Gestational diabetes - Gestational diabetes may be suspected where fetuses are found to be larger than known gestational age.

Polyhydramnios/ Oligohydramnios - Providers may suspect polyhydramnios or olgohydramnios in cases where gestational age is established and fundal height is significantly larger or smaller than expected.

Multiple gestation - Bimanual examination and fundal height measurements are usually significantly more advanced than expected when cross referenced with gestational age, in multiple pregnancies.

IUGR (intra uterine growth restriction) - Providers can be alerted to possible IUGR or fetal distress when known gestational age does not concur with manual or ultrasound examinations.

Suboptimal fetal position - Providers can be alerted to possible malpresentations such as breech or transverse lie, when known gestational age fails to coincide with fundal height.

Preterm labor/ premature delivery & management - Providers can more readily assess specific risks and minimize adverse outcomes in preterm labor and birth by having an accurate knowledge of gestational age.

Postdates - With well established dating, providers can determine the appropriateness of induction in cases of suspected postdates, thereby reducing the risk of unnecessary intervention, which is associated with iatrogenic morbidity.

Conclusion

Accurate knowledge of gestational age is essential to distinguish normal healthy pregnancies from pathological pregnancies. With so many aspects of a clinician's assessment of fetal development and maternal health being directly affected by the establishment of gestational age, it is imperative that clinicians carefully evaluate the accuracy of their method of dating.

References

- Rahman, Anika; Laura Katzive and Stanley K. Henshaw (June 1998). "A Global Review of Laws on Induced Abortion, 1985-1997". International Family Planning Perspectives 24 (2): 56–64 (see p.59). doi:10.2307/2991926. http://www.guttmacher.org/pubs/journals/2405698.pdf. Retrieved 2008-12-02.
- The American College of Obstetricians and Gynecologists Terminology Bulletin (September 1965) Number 1.
- Mittendorf et. al (June 1990) "The Length of Uncomplicated Human Gestation". Obstet Gynecol., Volume 75 Issue 6
- 4. http://www.medicationabortion.com/sidebars/accuratedating.html Retrieved 2010-08-03
- 5. Journal Reprod Med. (October 2002) 47(10):825-8.