Sonography is inevitable modality in today’s practice due to its enormous practical utility. Right from the day it was introduced in practice, it’s initial use was for G. age assessment – dating. Dating during early pregnancy has the advantage that at this time embryo do not reflect biological variations (Factor like race, geographical distribution, nutrition do not affect significantly). Although it is not worthy to perform EP ultrasound just for dating, unless there are indications for accurate dating.

11- 14 weeks scan one can predict dating with almost equal accuracy, at the same time can have the assessment of fetal structure, chromosomal markers & rule out major gross malformation or even can predict early growth problems. At that time one can define chorionicity & amniocity also with almost equal accuracy.

In Obstetrics many decisions & management are based on the accurate G. age know how of pregnancy, like deciding the timing of invasive procedure, for screening biochemical markers, Double marker between 9-12 weeks, Triple marker at 16 weeks, For deciding the termination limit, Induction of labor in IUGR & ill fetuses for better outcome of neonate.
Certain terminology:

1. Menstrual age: Is calculated from last menstrual period
2. Conception Age: From day of conception
3. G. Age : conception age + 14 days

   G. age is today used in place of menstrual age.

   Early pregnancy scan gives the best chance to date the pregnancy accurately. The best time to date pregnancy is between 6-9 weeks by CRL & best chorionicity & amnionicity can be defined at 8 weeks of pregnancy.

Dating of early pregnancy

**G. Sac:**

- Intradecidual sign
- Double Decidual sign

G. sac is visible right from 4 weeks 3-4 days. It is nothing but the chorionic sac with echogenic thick more than 2 mm border produced by the developing chorionic villi. It is eccentric & embedded completely in decidua (intra decidual sign) & as it grow it distort the endometrial canal & now towards side of uterine cavity it is covered by two decidua, decidua capsularis & parietalis, separated by endometrial cavity (Double decidual sign). G. sac grows at a rate of 1.1 mm / day up to 8 weeks of
pregnancy. It is filled by little echogenic fluid, chorionic fluid. G. sac is to be measured from inner to inner – Only anechoich area, excluding trophoblast. It is to be measured in three dimension, two transverse & one vertical to get the average – mean sac diameter (MSD). Many studies that has been published using the confirmed conception age as in IVF pregnancy has confirmed that G. sac is very accurate in G. age assessment with variability of ± 2 days. Mean sac diameter when measured it given G. age in day by simple formula - MSD in mm + 30 = G. age in days. One can use the table of G. age from G. sac (All machines are now equipped with the tables)

**Rules for G. sac measurement**

1. Largest sac diameter in longitudinal sagittal & transverse is to be freeze on screen
2. Inner to inner (Anechoic area) to be measured excluding trophoblast)
3. Two transverse & one vertical measurement & mean of all three is to be taken
4. Accuracy is ± 2 days
5. Once embryo is visible, it losses it’s accuracy, time to switch to CRL for G. age
6. Assessment

**CRL:**

CRL is although crown rump length, in practice it is maximum measurement of the embryo. Embryo is visible from 5 weeks & 5 days (CRL 2 mm) just at periphery of the yolk sac because at this stage there is no yolk stalk. As soon as the embryo is visible cardiac activity is visible, but it may not appear in few cases it may not be visible up to 5 mm size of embryo. Measurement of CRL gives the most accurate G. age ± 3- 5 days. All the data & studies that has been published are having a uniform voice mentioning the accuracy of the CRL for G. Age assessment. CRL is effective in G. age assessment from 7 weeks to 15 weeks. (transition period of 13 – 15 weeks to be considered to switch over to other biometry)
Rules for CRL measurement:

1. The embryo shall be with spine near the probe or away from probe so that the neutral position can be judged accurately. Chin not touching the chest in late early pregnancy. Limbs shall not be visible in exact sagittal plane.

2. Mid sagittal section of embryo – Bladder visible, no limb full length visible.

3. Maximum length of embryo to be measured.

In study of Macgregor et al accuracy of CRL was found to be low with increasing G. age – towards end of first trimester, probably reflecting the early biological variability. It was observed from various study that over all accuracy of CRL G. age was having ± 8% variability i.e. at CRL 11 weeks – G. age is 11 weeks ± 8% (11 weeks ± 9.5 days).
**BPD:**

With the availability of high resolution machines equipped with trans vaginal probe, many studies have been published on assessment of G. age by other biometric parameters like BPD, FL, AC. The data up till now published confirms the reasonable accuracy of BPD, AC, FL & other parameters but it do not have upper edge compare to CRL. It is difficult to measure other biometry compared to CRL with accuracy before 13 weeks of pregnancy, although data on BPD are published from 7 weeks onwards. However, after 13 weeks – transition from first trimester to second trimester, it become important to switch over to other biometry.

**Chorionicity**

All Multi fetal pregnancy are high risk pregnancy & it’s risk is variable depending upon the chorionicity. Chorion is nothing but the developing placenta & when a multifetal pregnancy share the placenta, it mean that they share the circulation also. When same circulation is shared by fetuses, one of may get more supply at the cost of other due to A-A, A-V or V-V connections & outcome will affect both. At the same time there are other risk of monochorionicity also like twin twin transfusion syndrome (TTTS), Acardiac twin, cord entanglement, Conjoined twin, parasitic twin, fetus in fetu, which is having direct impact on the the outcome. In table 1 out come of pregnancy based on chorionicity is well presented.
Perinatal Morbidity with different chorionicity

Chorionicity & amnionicity is predictor of prognosis of multifetal pregnancy. Due to high perinatal morbidity & mortality with the monochorionic twin, defining chorionicity is an important first step towards better management of multifetal pregnancy. During selective fetal reduction, invasive testing for chromosomal analysis also requires defining chorionicity as monochorionic fetal reduction using potassium chloride will lead to death of other fetus also. In dichorionic sampling of both the fetus is mandatory.

**Defining Chorionicity**

<table>
<thead>
<tr>
<th>Step</th>
<th>Define no of Placenta</th>
<th>Separate Placenta</th>
<th>Dichorionic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Placenta together</td>
<td>Chorionicity undetermined</td>
</tr>
<tr>
<td>Step 2</td>
<td>Define Lambda Sign / T sign</td>
<td>Lambda sign</td>
<td>Dichorionic</td>
</tr>
<tr>
<td></td>
<td>“T” Sign</td>
<td></td>
<td>Monochorionic</td>
</tr>
<tr>
<td>Step 3</td>
<td>Thickness of membrane</td>
<td>Thick membrane (4 layers)</td>
<td>Dichorionic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thin Membrane (2 layers)</td>
<td>Monochorionic</td>
</tr>
<tr>
<td>Step 4</td>
<td>Sex of fetus</td>
<td>Different sex</td>
<td>Dichorionic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same sex</td>
<td>Chorionicity undetermined</td>
</tr>
</tbody>
</table>
No of Placenta:

Two Placenta

Single Placenta

Lambda Sign / “T” Sign

Lambda Sign

“T” Sign

Thickness of membrane

Thick Membrane

Thin Membrane
Embryology:

- Type of twinning depends upon
  - No of fertilized ova (Dizygotic Twin)
  - Time of zygote division (Monozygotic Twin)

Zygocity

- Can only be determined by DNA fingerprinting.
- Prenatally, such testing would require an invasive procedure to sample
  - Amniotic fluid (amniocentesis),
  - Placental tissue (chorionic villus sampling) or
  - Fetal blood (cordocentesis).
All Dizygotic twins are Dichorionic

Monozygotic twin

1. Dichorionic Diamniotic
2. Dichorionic Monoamniotic
3. Monochorionic Monoamniotic

All monochorionic twins

1. Diamniotic
2. Monoamniotic
   a. Normal fetuses
   b. Acardiac twin
   c. Parasitic twin
   d. Fetus in fetu

Monochorionic twins complications

1. TTTS (Twin Twin transfusion syndrome)
2. Acardiac twin (Twin reversed arterial perfusion syndrome) TRAP
3. Cord entanglement

References:

1. Ultrasound in Obst & Gynecology 5th Edition Peter callen 225 – 230
4. Reecce EA; GabrieliS, Degero N et al, Dating through pregnancy, a measure of growing up Obst Gyn survey. 44;544, 1989