

Sri Lanka College of Obstetricians and Gynaecologists Guideline

Gestational age assessment and determination of chorionicity in multiple pregnancy

1. Aims

Around 370,000 babies are born each year in Sri Lanka. There is no national policy of ultrasound assessment of gestational age for all pregnancies. Currently, last regular menstrual period (LRMP) is used for calculation of the gestational age. In case of ultrasound dating, timing of ultrasound will vary upon the preference of the Obstetrician. The aim of this guideline is to set evidence-based standards in gestational age assessment and determination of chorionicity in multiple gestations.

2. Background and introduction

Gestational age assessment by menstrual history is not accurate because up to 40% of women are uncertain of their menstrual dates or ovulation may not exactly correspond with the mid menstrual cycle¹. Therefore, gestational age derived from last menstrual period is subjected to both random and systematic errors². Overestimation of true gestational age by menstrual history increases the prevalence of post date pregnancies³. First trimester ultrasound dating using crownrump length (CRL) has proven to be more reliable than methods based on LRMP to predict the date of delivery. First trimester ultrasound dating can reduce the percentage of post term pregnancies by up to 60%^{4,5,6}. Second trimester pregnancy dating is also reliable but it is not as accurate as first trimester dating⁶. Further, early determination of chorionicity is important in order to optimize the outcome in twin pregnancies.

3. Identification and assessment of evidence

This guideline was developed after searching evidence from EMBASE, Medline and PubMed electronic

databases. Relevant randomized controlled trials, systematic reviews, meta-analyses and cohort studies were considered.

4. What is the best method of determining gestational age during first trimester?

An early ultrasound scan after 8⁺⁰ weeks should be offered to all pregnant women in order to assess gestational age (in lieu of last menstrual period (LMP) for all cases) and to detect multiple pregnancies. Consistent use of first trimester ultrasound for gestational age assessment will reduce the need for induction of labour after 41 weeks.

Ideally, scans should be performed between 11⁺⁰ and 13⁺⁶ weeks and use measurement of crownrump length (CRL) (CRL measures from 45 mm to 84 mm) to determine gestational age. Robinson's formula should be

used to convert CRL measurement in to a gestational age (GA)⁸. Once the initial dating has been assigned, dating should not be reassigned based on subsequent scans. All the ultrasound biometry parameters of subsequent scans should be plotted on the growth charts and any deviation of growth should be interpreted in relation to the GA derived from initial dating.

$$GA = 8.052 \times (CRL \times 1.037)^{1/2} + 23.73$$

Technique for CRL

CRL measurements can be obtained either transabdominally or transvaginally. The whole fetus should be horizontal on the screen so that the line between crown and rump is at 90° to the ultrasound beam and following criteria should be met (Figure 1).

Figure 1. Mid sagittal section of the fetus in neutral position



- A long axis of the fetus in mid-sagittal (median) section is obtained.
- A fetus should be in neutral position
- Measurements are taken from
 - The top of the head (crown) to the end of the trunk (rump) using the onscreen calipers.

5. What is the best method of determining gestational age during second trimester?

Pregnant women who present at or beyond 14 weeks of gestation up to 26 weeks should be offered an ultrasound scan to estimate GA using head circumference (HC)⁹. HC measurement can be calculated from the biparietal diameter (BPD) and the occipital-frontal diameter (OFD) using the formula.

$$HC = \delta (BPD + OFD) / 2$$

Modern ultrasound machines can calculate the HC directly from the diameters of the head using the ellipse facility. Deriving the head circumference in this way is

acceptable provided that the above equation is used. Gestational age should be estimated from HC using the Chitty's formula¹⁰.

$$\log_e(GA) = 0.010611HC - 0.000030321HC^2 + 0.43498 \times 10^{-7}HC^3 + 1.848$$

Technique for HC

The image should be frozen when the following landmarks are identified (Figure 2).

- A cross-sectional view of the fetal head at the level of the ventricles should be obtained.
- A rugby football-shaped skull, rounded at the back (occiput) and more pointed at the front (synciput).
- A long midline equidistant from the proximal and distal skull echoes.
- The cavum septum pellucidum bisecting the midline one-third of the distance from the synciput to the occiput.
- The two anterior horns of the

lateral ventricles symmetrically placed about the midline.

- All or part of the posterior horns of the lateral ventricles symmetrically placed about the midline.
- To measure the BPD and OFD the intersection of the calipers should be placed on the outer border of the skull ('outer to outer').

6. What is the best method of determining gestational age for late bookers (beyond 26 weeks)?

After 26 weeks gestation, it is not possible to assess GA accurately using ultrasound. Pregnant women who present at that time should be informed of the limitations of ultrasound dating and be offered two scans 2 weeks apart. A tentative estimate of gestational age should be assigned using HC during the first scan and repeat HC measurement in 2 weeks should be arranged in order to confirm the GA. Gestational age can be confirmed if the HC in second scan corresponds with the initial ultrasound dating¹¹. If they do not tally, senior opinion should be sought.

7. What is the best method of determining gestational age in multiple pregnancies?

Women with twin and triplet pregnancies must be offered a first trimester ultrasound scan when crown-rump length measures between 45 to 84 mm (at approximately 11⁺⁰ - 13⁺⁶) to estimate gestational age and to determine chorionicity^{12,13}. Women with multiple pregnancies who present at or beyond 14 weeks of gestation should be offered an ultrasound scan to estimate gestational age using head circumference (HC)¹⁴. Measurement from the largest baby is used, to avoid the risk of estimating it from a baby with early growth pathology^{12,14,15}.

Figure 2. Transverse section of the fetal head demonstrating the landmarks required to measure the HC using the lateral ventricles view. CSP: cavum septum pellucidum, PH: Posterior horn of the lateral ventricle



8. What is the best method of determining chorionicity and assign nomenclature in multiple pregnancies?

Chorionicity must be determined during the first trimester by ultrasound using the number of placental masses, the lambda or T-sign (Figure 3)¹³.

If a woman with a twin or triplet pregnancy presents after 14⁺⁰, chorionicity is determined at the earliest opportunity using one or combination of the following ultrasound markers¹⁶⁻¹⁸.

- o The number of placental masses
- o The lambda or T-sign
- o Membrane thickness (thresholds for determining mono-chorionicity is from 1.0 to 2.0 mm)
- o Discordant fetal sex.

If it is not possible to determine chorionicity by ultrasound at the time of detecting the twin or triplet pregnancy, a second opinion should be sought from a senior doctor or refer the woman to an expert who

is competent in determining chorionicity as soon as possible.

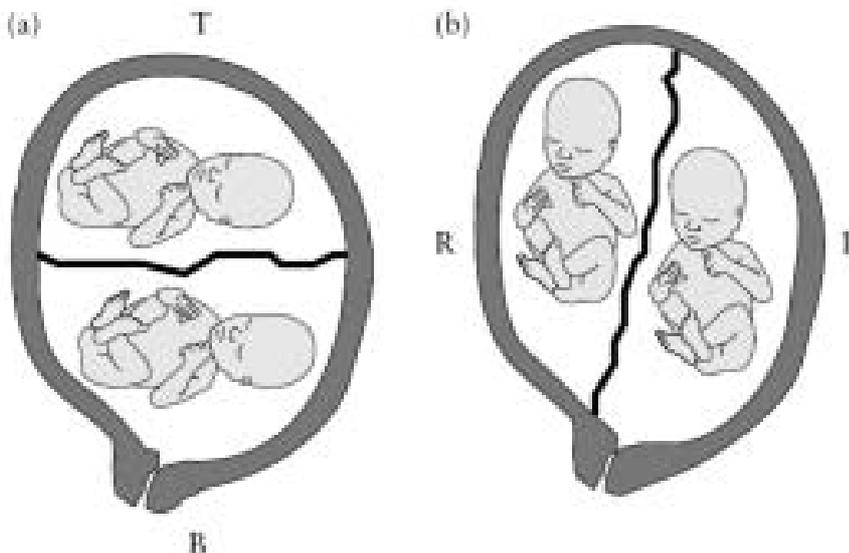
If it is difficult to determine chorionicity, even after referral (for example, because the woman has booked late in pregnancy), the pregnancy should be managed as monochorionic until proved otherwise.

The relative orientation of the fetuses to each other in relation to long axis of the uterus (Figure 4) should be defined as either lateral (left/right) or vertical (top/bottom). Lateral fetal orientation is associated with an intertwin membrane running vertically along the longitudinal axis of the uterus and vertical fetal orientation is associated with an intertwin membrane running horizontally across the longitudinal axis of the uterus. Assigned nomenclature to babies (for example, top/bottom, or left/right) in twin and triplet pregnancies should be documented clearly in the woman's notes to ensure consistency throughout pregnancy¹⁵. ■

Figure 3. Left - Lambda sign (λ-sign) in dichorionic twin pregnancy and Right - 'T' sign in monochorionic twin pregnancy



Figure 4. Diagrammatic representation of twin orientation relative to the longitudinal axis of the uterus. The twins may have a top/bottom (T/B) (vertical) (a) or right/left (R/L) (lateral) (b) orientation



REFERENCES

1. Olsen O, Clausen JA. Routine ultrasound dating has not been shown to be more accurate than the calendar method. *Br J Obstet Gynaecol* 1997; 1: 1221-2.
2. Savitz DA, Terry JW Jr, Dole N, Thorp JM Jr, Siega-Riz AM, Herring AH. Comparison of pregnancy dating by last menstrual period, ultrasound scanning, and their combination. *Am J Obstet Gynecol* 2002 Dec; 187(6): 1660-6.
3. Gardosi J. Dating of pregnancy: time to forget the last menstrual period. *Ultrasound Obstet Gynecol* 1997; 9(6): 367-8.
4. Neilson JP. Ultrasound for fetal assessment in early pregnancy. *Cochrane Database Syst Rev* 2001, Art. No.: CD000182. DOI: 10.1002/14651858.CD000182.
5. Grange G, Pannier E, Goffinet F, Cabrol D, Zorn JR. Dating biometry during the first trimester: accuracy of an everyday practice. *Eur J Obstet Gynaecol Reprod Biol* 2000; 88: 61-4.

- 6.** Daya S. Accuracy of gestational age estimation by means of fetal crown-rump length measurement. *Am J Obstet Gynecol* 1993; 168: 903-8.
- 7.** Caughey AB, MD, Nicholson JM, Washington AE. First versus second trimester ultrasound: the effect on pregnancy dating and perinatal outcomes. *Am J Obstet Gynecol* 2008; 198(6): 703.e1-703.e6. doi:10.1016/j.ajog.2008.03.034.
- 8.** Robinson HP. Sonar measurement of fetal crown-rump length as means of assessing maturity in first trimester of pregnancy. *BMJ* 1973; 4: 28-31.
- 9.** Johnsen SL, Rasmussen S, Sollien R, Kiserud T. Second trimester fetal head circumference and biparietal diameter for predicting the time of spontaneous birth. *J Perinat Med.* 2006; 34(5): 367-70. Accuracy
- 10.** Chitty LS, Altman DG, Henderson A, Campbell S. Charts of fetal size: 2. Head measurements. *Br J Obstet Gynaecol* 1994; 101: 35-43.
- 11.** Chudleigh T, Thilaganathan B. Routine second trimester screening - assessing gestational age. In *Obstetric Ultrasound: How, Why and When* (3rd edn), Elsevier, Churchill Livingstone: London, 2004; 98-107.
- 12.** Dias T, Mahsud-Dornan S, Thilaganathan B, Papageorgiou A, Bhide A. First-trimester ultrasound dating of twin pregnancy: are singleton charts reliable? *BJOG.* 2010 Jul; 117(8): 979-84.
- 13.** Dias T, Arcangeli T, Bhide A, Napolitano R, Mahsud-Dornan S, Thilaganathan B. First-trimester ultrasound determination of chorionicity in twin pregnancy. *Ultrasound Obstet Gynecol.* 2011 Nov; 38(5): 530-2.
- 14.** Dias T, Arcangeli T, Bhide A, Mahsud-Dornan S, Papageorgiou A, Thilaganathan B. Second-trimester assessment of gestational age in twins: validation of singleton biometry charts. *Ultrasound Obstet Gynecol.* 2011 Jan; 37(1): 34-7.
- 15.** Dias T, Ladd S, Mahsud-Dornan S, Bhide A, Papageorgiou AT, Thilaganathan B. Systematic labeling of twin pregnancies on ultrasound. *Ultrasound Obstet Gynecol.* 2011 Aug; 38(2): 130-3.
- 16.** Menon DK. A retrospective study of the accuracy of sonographic chorionicity determination in twin pregnancies. *Twin Res Hum Genet* 2005; 8: 259-61.
- 17.** Stenhouse E, Hardwick C, Maharaj S, Webb J, Kelly T, Mackenzie FM. Chorionicity determination in twin pregnancies: how accurate are we? *Ultrasound Obstet Gynecol* 2002; 19: 350-2.
- 18.** Scardo JA, Ellings JM, Newman RB. Prospective determination of chorionicity, amnionicity and zygosity in twin gestations. *Am J Obstet Gynecol* 1995; 173: 1376-80.
- 19.** Chitty LS, Altman DG, Henderson A, Campbell S. Charts of fetal size: 3. Abdominal measurements. *Br J Obstet Gynaecol* 1994; 101: 125-31.
- 20.** Loughna P, Chitty L, Evans T, Chudleigh T. Fetal size and dating: charts recommended for clinical obstetric practice. *Ultrasound* 2009; 17(3): 161-7.

(Appendixes on page 45-46)

Appendix 1¹⁹⁻²⁰

CRL dating table
(Adopted from Loughna *et al*)

CRL (mm)	50th Centile
16	8+1
17	8+2
18	8+3
19	8+3
20	8+4
21	8+5
22	8+6
23	9+0
24	9+1
25	9+2
26	9+3
27	9+3
28	9+4
29	9+5
30	9+6
31	9+6
32	10+0
33	10+1
34	10+2
35	10+2
36	10+3
37	10+4
38	10+4
39	10+5
40	10+6
41	10+6
42	11+0
43	11+0
44	11+1
45	11+2
46	11+2
47	11+3
48	11+4
49	11+4
50	11+5
51	11+5
52	11+6
53	11+6
54	12+0
55	12+1
56	12+1
57	12+2
58	12+2
59	12+3
60	12+3
61	12+4
62	12+4
63	12+5
64	12+5
65	12+6
66	12+6
67	13+0
68	13+0
69	13+1
70	13+1
71	13+2
72	13+2
73	13+3
74	13+3
75	13+4
76	13+4
77	13+5
78	13+5
79	13+6
80	13+6

Head Circumference dating table
(Adopted from Chitty *et al.* and Loughna *et al*)

Head circumference (mm)	50th centile
80	12+4
85	12+6
90	13+2
95	13+5
100	14+1
105	14+4
110	15+0
115	15+3
120	15+6
125	16+2
130	16+4
135	17+0
140	17+3
145	17+6
150	18+2
155	18+5
160	19+1
165	19+3
170	19+6
175	20+2
180	20+5
185	21+1
190	21+4
195	22+0
200	22+2
205	22+5
210	23+1
215	23+4
220	24+0
225	24+3
230	24+6
235	25+3
240	25+6
245	26+2
250	26+5
255	27+2
260	27+5
265	28+2
270	28+6
275	29+3
280	30+0
285	30+4
290	31+1
295	31+5
300	32+3
305	33+1
310	33+6
315	34+4
320	35+3

Appendix 2

Head circumference size chart (Chitty et al. and Loughna et al.)

