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Determination of Gestational Age from Crown-Rump Length and Correlation with Volume and Mean Sac Diameters

Abstract

Introduction: Sonographic measurements of fetal ultrasound parameters are the basis for accurate determination of gestational age and detection of fetal growth abnormalities. CRL (crown-rump length) is the best parameter for early dating of pregnancy.

The objective of this study was to determine the relationship between gestational age and measurement of mean diameter of gestational sac, volume of sac, and crown-rump length in a group of pregnant women who had regular cycles and certain dates.

Materials and Methods: This descriptive study was done in Sina Hospital in 2000-2004. Measurements of gestational sac diameter, volume, and crown-rump length (CRL) were collected from 417 normal singleton fetuses. Charts and predictive equations were constructed from data obtained from pregnancies in which the CRL was between 6 and 60 mm and for which the outcome was normal.

Results: CRL maintained the highest correlation with gestational age ($r = 0.935$, p less than 0.0001). The standard error of estimates using CRL was significantly lower than that using mean gestational sac or volume of the sac. The 95% reference interval was, ± 4.86 days for CRL. The best fit regression equation was the quadratic model.

$\text{Age (week)} = 5.822 + 1.610 \text{ CRL (cm)} - 0.080(\text{CRL})^2(\text{cm})$. A chart for CRL derived from the regression equation are presented and compared with those obtained by Robinson & Fleming and Hadlock.

Linear relationships were found between the mean gestational sac diameters (MDS) and gestational age ($r = 0.886$, p less than 0.0001), and volume of gestational sac ($r = 0.814$, p less than 0.0001).

Conclusion: There were no significant differences between the Iranian and European parameters for the CRL and mean gestational sac curves. Crown-rump length (CRL) between 6 and 12 weeks is the most accurate parameter for first-trimester dating.

Key words: CRL (crown-rump length), LMP (last menstrual period), MSD (mean gestational sac), Regression equation

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