

## TRANSVAGINAL SONOGRAPHIC PREDICTIVE PARAMETERS IN EARLY PREGNANCY LOSS

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### SUMMARY

Transvaginal sonography was done in 100 early pregnancy evaluation. A significant linear relationship between Gestational sac at different ages was observed and rate of growth of the same was 0.96 mm/day from 5 to 9 weeks. Mean yolk sac diameter was 4.1999 mm. Abnormalities of yolk sac is suggestive of abnormal embryonic development with a sensitivity of 63.6%, specificity of 96.4% and PPV of 72.7%. Fetal heart beat had a sensitivity of 93%, specificity of 98%, PPV of 93% and NPV of 98%.

Embryonic movement also had a sensitivity of 100%, specificity of 93.8%, PPV of 88% and NPV of 100. thus careful observation by TVS gives accurate & reassuring findings in early pregnancy.

### INTRODUCTION

The rapidity of technological advances leading to the ability to observe smaller and smaller structures has occurred simultaneously with advances in diagnostic abilities by Transvaginal Sonography as well as observation of normal from abnormal findings in early pregnancy.

Transvaginal sonography represents a new approach in prenatal evaluation. The first 12 weeks of pregnancy is the most

critical and tenuous period in the obstetrical experience. For the sonographer TVS permits the visualisation of these first 12 weeks with unsurpassed detail. In this study an attempt has been made to study early embryonic development, sonographic landmarks and early pregnancy dating and outcome correlated with TVS findings.

### MATERIALS & METHODS

Hundred early pregnancies were evaluated by TVS. Gestational age ranged from 5-12 weeks At each sonographic exami-

nation at the outset, the location and size of the Gestational sac was noted. To obtain biometric measurement of gestational sac, the maximum longitudinal diameter from margins of the sac was taken. After a 90 degree rotation of the probe the maximum A-P and Transverse diameters were also obtained. Measurements were taken from the inner sac wall thereby avoiding the variability associated with the surrounding decidual reaction. Average of the three measurements were taken as the gestational sac diameter. Shape of gestational sac was noted as regular or irregular. Yolk sac was identified inside the gestational sac and measurement was taken. Abnormal yolk sac shape was noted if there was any substantial change from the normal outline.

Presence or absence of fetal pole was noted. Measurements of Crown-Rump length (CRL) were obtained from the maximum length of embryo. Presence or absence of embryo heart beats, limb buds and embryo movements were noted. Mean gestational

sac diameter was calculated for each Gestational age. Appearance and disappearance of yolk sac was noted. Yolk sac diameter of abnormal group was compared with that of normal group in predicting an abnormal outcome. An abnormal yolk sac measurement was defined as being more than 2 SD above or below the mean.

#### ANALYSIS AND OBSERVATION

The mean Gestational sac diameter with 2 SD is shown in Table 1. There was a linear progressive sac enlargement. Rate of growth of Gestational sac normally was 0.955 mm, per day from 5 weeks to 9 weeks. Table 1. Relationship between gestational age and mean gestational sac diameter.

Yolk sac and its correlation in early pregnancy was analysed. It was identified by 5 weeks when Gestational sac measured 9 mm. Yolk sac was not seen beyond 9 mm. Frequency of yolk sac presence between 5 and 9 weeks was 100% and ranged between

**Table I**  
**Relationship between gestational age and mean gestational sac diameter.**

Gestational age (weeks)	Mean Gestational sac diameter	2 SD
5	9	0.0
5	16.3	2.19
7	24.7	3.84
8	30.9	4.44
9	35.2	3.41
10	41.8	3.54
11	49.7	3.54
12	56.0	1.26

**Table II**  
**Yolk sac**

Gest age (weeks)	Frequency of yolk sac	Mean diameter of yolk sac (mm)	2 SD
5	100	3	1.41
6	100	4.37	0.89
7	100	4.6	0.92
8	100	4.7	0.77
9	100	4.2	2.52

3 m to 4.29 mm from 5 to 9 weeks. The 2 SD range is shown in Table 2.

From the data in Table 2 the mean diameter of yolk sac was calculated as 4.19 mm in normal cases. In cases of abnormal outcome, the yolk sac was abnormal in both size and shape.

#### **CROWN RUMP LENGTH (CRL)**

CRL could be measured from 7 weeks onwards in all the normal cases studied.

Range and mean of CRL for each gestational age was obtained.

By TVS earliest age at which gestational sac could be identified was at 5 weeks gestation.

Fetal pole could be identified from 6 weeks onwards when mean gestational sac diameter measured 16 mm.

Accuracy of fetal pole in predicting abnormal outcome was determined. Cardiac pulsations could be identified in 75% of

**Table III**  
**Crown Rump Length (CRL)**

Gestational age (weeks)	Range (mm)	Mean (mm)	2 SD
7	8-17	12.83	2.39
8	14-25	18.71	3.24
9	13-32	22.86	4.54
10	27-37	33.18	3.06
11	40-50	43	4.76
12	50	53	

**Table IV**  
Accuracy of various parameters in predicting abnormal outcome with TVS (%)

	Gest sac shape	Yolk sac	Fetal pole	Cardiac pulsation	Embryo movement
Sensitivity	82.7	63.6	82.7	93.1	100
Specificity	97.7	96.4	95.4	98.0	93.7
Positive predictive value	92.3	72.7	85.7	93.0	88.0
Negative predictive value	94.5	93.2	94.3	98.0	100.0

cases with normal outcome from 6 weeks onwards when mean gestational sac diameter measured 16 mm. Accuracy of fetal pole was 82.7%. Sensitivity, 95.4% specificity, positive predictive value 85.7% negative predictive value of 94.3% whereas accuracy of cardiac pulsations in predicting abnormal outcome was sensitivity of 93.1%, specificity of 98%, positive predictive value 93% and negative predictive value of 98%. (Table IV) The embryo body movement accuracy in prediction was sensitivity 100%, specificity 93.7%, positive predictive value 88% and negative predictive value of 100%.

#### DISCUSSION

There was a significant linear relationship between all embryologic parameters and gestational age. From this correlation Regression (R) and P value were obtained.

Fossum et al (1988) identified fetal pole from 36 - 43 days. In the present study fetal pole was identified from 6 wks with -

Sensitivity of 82.7%, specificity of 95.4%. PPV of 85.7% and NPV of 94.3%

Levi et al (1988) identified from 6 weeks onwards with sensitivity of 50%, specificity of 100%, PPV of 100% and NPV of 91%.

Yolk sac in the present study had a mean diameter of 4.199 mm compared to the study of Goldstein which showed 4 mm. The rate of gestational sac growth was 0.96 mm/day as compared to other authors 1mm / day.

Goldstein et al (1988), recorded predictive values for embryo body movement as sensitivity of 100% specificity of 92.8% PPV of 94.3% and NPV of 100% correlating well with our study.

Nyberg et al (1983) established major criteria for distinguishing between normal and abnormal embryos with TVS as (1) a gestational sac >8 mm mean sac diameter without yolk sac or a gestational sac of 12 - 18 mm mean sac diameter without

an embryo of > 18 mm without cardiac activity.

(2) Abnormal shape of gestational sac.

The demonstration of yolk sac may be critical in differentiating an early intra-uterine gestational sac from a decidual reaction of ectopic pregnancy. A abnormal yolk sac measurement is defined as being more than 2 SD above or below the mean. Yolk sacs less than or equal to 2 mm were associated with poor outcome. Abnormal embryologic development is highly probable if a yolk sac is not visible in gestational sac larger than 8 mm. Yolk sac abnormality suggests pregnancy failure (Reece EA et al 1988). The function of yolk sac are

1) Provision of essential nutrients to the developing embryo 2) First site of hematopoiesis 3) Origin of the primary germ cells that eventually form spermato-cytes 4) Development of embryonic endoderm which forms the primitive gut 5) Initial site of AFP, Prealbumin, albumin and transferrin.

### CONCLUSION

Early embryonic development is essential to be understood to know the normality for better management of first trimester problems. Transvaginal sonography has a temporal advantage of detecting different embryonic landmarks early. Hence TVS provides an unsurpassed opportunity to observe normal human development. TVS provides a confident diagnosis and assists in management. Thus TVS has rapidly become the 'Gold standard' in early pregnancy evaluation.

### REFERENCES

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