Optimum Placental Thickness for Chorionic Villous Sampling

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One hundred and sixteen females of 10 to 13 weeks of gestation were studied by three dimensional ultrasound diagnostic technique, to obtain thickness of placenta for aspiration of chorionic villi. Previously chorionic villous sampling was done with reference to age of fetus without measuring the placental thickness. In this study adequate sampling was obtained due to prior measurement of placental thickness. The optimum placental thickness for proper chorionic villous sampling was found to be 1.25 cm.
Key words: chorionic villous sampling, placental thickness, gestational age.

Previously chorionic villous sampling was done by considering the age of fetus (in first trimester) without measuring the placental thickness[1, 2,3,4,5]. Now with the latest three dimensional diagnostic ultrasound techniques, it becomes easier to clearly visualize, localize, measure and characterize the placental thickness repetitively with complete safety throughout pregnancy[6, 7]. So aspiration of chorionic villi became possible For this purpose transabdominal method (introduced in 1986) is simple, precise and safe (for visualization of placenta). Its accuracy is 93 to 98% [8].

The presence of gestational sac in uterus (on ultrasound) confirms pregnancy[7], and measurement of biparietal diameter by ultrasound provides a useful means for assessment of gestational age[9]. Crown rump length has consistently been found to be the most accurate method of determining gestational age in the first trimester[10].

Chorionic villous sampling is a safe and effective technique, introduced by Hahaneman and Mohr in 1968. In 1982, first report of chorionic villous sampling was published by Rozvisky, 1982. In 1983 several reports of chorionic villous sampling were published with success rate of 0 to 78%. Chorionic villous sampling is a safe and effective technique. Since this tissue is derived from the fertilized ovum, it nearly always reliably reflects the genetic constitution of the fetus.As the risks involved in chorionic villous sampling and amniocentesis are nearly the same but chorionic villous sampling is better because it can be done in first trimester (9-13 weeks) so chorionic villous sampling can replace amniocentesis[5].

Rapid analytical techniques reduce significantly the waiting time between sampling and diagnosis[1]. From its introduction in the mid 1980's as a technique of first trimester prenatal diagnosis chorionic villous sampling has been monitored intensively with regard to both safety and accuracy [11].

Chorionic villous sampling is an accurate method for prenatal chromosome analysis[11]. Cytogenetic results have been confirmed to be reliable and accurate. Chorionic villous sampling is a low risk method for rapid karyotyping during the entire pregnancy[12]. Chorionic villous sampling can be performed with confidence for the early prenatal diagnosis of fetal cytogenetic, molecular, and biochemical disorders[13]. Discordant non-mosaic karyotypes can be detected prenately by chorionic villous sampling [14].

Transcervical chorionic villous sampling was introduced in 1983[15]. Transabdominal chorionic villous sampling was introduced in 1986[16]. This has resulted in significant fall in the birth prevalence of Down's syndrome[17]. Earlier concerns about procedure induced limb defects were reduced with the accumulation of additional data, showing minimal to no risk when chorionic villous sampling is performed after 70 days of gestation[18].

As it is performed in the IST trimester of pregnancy it provides a substantial advantage in terms of time over amniocentesis, which is usually performed around 16th week of gestation and the results are usually not available before 18th weeks of gestation[19, 20].

Subject and procedure:
A total of 116 females during 10 to 13 weeks of gestation were selected and divided in two groups. In control group 58 ladies were included, two each of gestational period 10.1(10 weeks one day) 10.2, 10.3, and so on up to 13 weeks. The ladies were selected from the ones visiting Abdullah Diagnostic Center for routine obstetrical ultrasound examination. They all had regular periods and last menstrual period was known. It was re- confirmed on crown rump length measurement, both (CRL and LMP) were very close $\pm$ 2-3 days, confirming the accurate LMP. They had no history of previous genetic disorder in their own children or in immediate family. Therefore chorionic villous sampling was not advised in these subjects. 58 ladies were included in this group two each of gestational period 10.1, 10.2, and 10.3, and so on up to 13 weeks. This was sequential sampling. Chorionic villous sampling was done in cases in which either the mother's age was more than 35 or there is there was history of chromosomal or genetic birth defects.

Parameters studied were assessment of fetal age (through Crown Rump Length) and measuring the thickness of placenta

The data was analyzed by one-way analysis of variance (ANOVA). The values obtained for placental

thickness and success of sampling or failure was compared. Differences were accepted as significant at level of 0.01. Results were presented as means and standard deviations.

Results

The mean CRL for control group

- 10^{th} week was 2.50 cm (+ 0.26 SD).
- 11^{th} week was 3.46 cm (+ 0.30 SD).
- 12^{th} week was 4.51 cm (± 0.34 SD).
- 13^{th} week was 5.71 cm (± 0.41 SD).

Table 1. Distribution of cases according to placental thickness

Placental thickness (cm)	Number		Percent	
	Control Group	Procedure Group	Control Group	Procedure Group
<1.0	12	11	20.7	19.0
1-1.5	21	20	36.2	34.5
1.6-2.0	9	20	15.5	34.5
2.1-2.5	11	3	19.0	5.1
> 2.5	5	4	8.6	6.9

The mean CRL for procedure group

- 10^{th} week was 2.50 cm (+ 0.26 SD).
- 11^{th} week was 3.46 cm (+ 0.30 SD).
- 12^{th} week was 4.51 cm (± 0.34 SD).
- 13^{th} week was 5.71 cm (± 0.41 SD).

Table 2. Relationship of placental thickness and success of sampling

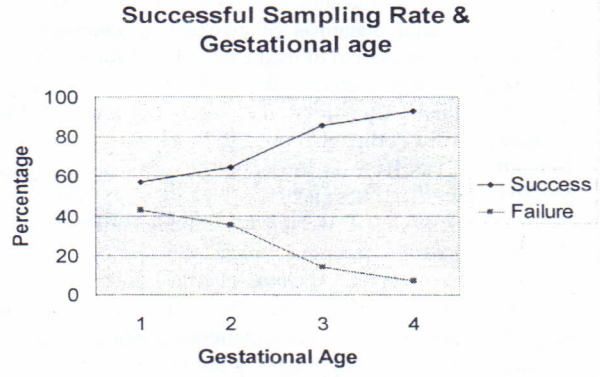
Placental thickness (cms)	Non successful	%age	Successful sampling	%age	Total
0.6-0.99	10	90.9	1	9.1	11
1.0-1.49	3	17.6	14	82.4	17
1.50-1.99	0	0	20	100	20
2.0-2.49	0	0	5	100	5
2.5-2.99	0	0	5	100	5

As the placental thickness crosses 1.25 cms the success rate becomes 100%.

The mean placental thickness for control group in

- 10^{th} week was 1.13 cm (+ 0.31 SD)
- 11^{th} week it was 1.10 cm (+ 0.36 SD).
- 12^{th} week it was 1.98 cm (+ 0.46 SD).
- 13^{th} week in the same control group was 1.92cm (±0.68 SD).

Graph 1

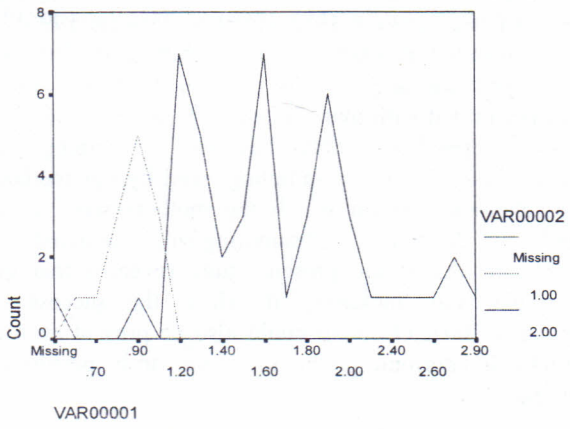


Mean placental thickness for procedure group in

- 10^{th} week was 1.2cm (+ 0.35 SD).
- 11^{th} week was 1.3cm (+ 0.54 SD).
- 12^{th} week was 1.7cm (+ 0.60 SD).
- 13 week was 1.8cm (+ 0.54 SD).

The number of subjects who underwent successful sampling in 10^{th} week was 8 out of 14 (57.13%), in 11^{th} week they were 9 out of 14 (64.65%), in 12^{th} week they were 12 out of 14 (85.72%), and in 13^{th} week they were 13 out of 14 (92.86%).

Graph 2: Relationship of placental thickness with successful sampling



1.00-----not successful; 2.00-------successful

Discussion

Previously the chorionic villous sampling was done with reference to the gestational age of fetus only (in first trimester). In that situation the success of sampling was doubtful, as the thickness of placenta was not measured prior to sampling. And as the placental thickness varies for different subjects at the same gestational age, hence the adequate sample was obtained at 8th week and at times not, even at 11^{th} week. If the placental thickness is known prior to chorionic villous sampling, inadequate sampling is avoided thus making this study more helpful and reliable to the obstetrician

Sei et al,[13] in their studies took chorionic villous sample by knowing only the gestational age, which resulted in 54.5% failure (failure is less than 5 mg of villi). They had to perform amniocentesis afterward, as their sampling was not appropriate (64.1%). Moreover the late results in case of amniocentesis create a difficult situation for evacuation of uterus in case of genetic disorder, whereas our results are different, as placental thickness was measured before sampling so adequate sampling was done. Our study was done to get the optimum placental thickness at which the success of sampling could be 100%, so that the patient does not suffer from either the physical or psychological fatigue of undergoing the process of repeated sampling, or the post chorionic villous sampling amniocentesis.

In women 35 years of age or older, there is a strong indication for prenatal diagnosis. The likelihood of at least one twin having a chromosomal abnormality is 1.5 times higher than in singleton pregnancies[21], hence the need for chorionic villous sampling is increasing day by day. Our method is also helpful for direct enzyme essay[13]

The birth rate among women aged 35 years or over has increased from 5.2% in 1982 to 13.5% in 1996 among approximately 20, 000 total births annually in America[17]. The total prevalence of Downs's syndrome has increased significantly from 1.05 to 1.67 per 1000 births, a rate of increase of 3.5% a year is directly co-related with age the proportion of Down's syndrome cases, which were detected and terminated after chorionic villous sampling, increased from 7.1% (in 1982-1986) to 75% (in 1996) [17]. This has resulted in a 60% decline in birth prevalence of Down's syndrome due to early prenatal diagnosis, which can be performed with more accuracy by our method. The ultrasound dependent prenatal diagnosis is becoming very popular (chorionic villous sampling), and by our method, the psychological strain which the mothers were under going [22, 23, 24,] due to repeated sampling will be avoided.

The results of the present study revealed that the proper placental thickness, at which the success of sampling is 100% (1.25cm) could also be present even at 10 weeks, so chorionic villous sampling can be performed at this age.

Conclusion

The conclusion drawn from the present work is that it is better to know the exact placental thickness at which proper chorionic villus sampling should be taken rather than just depending on gestational age. As at the same gestational age the placental thickness is different for two different subjects.

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