

Role of Ultrasound in the Determination of Chorionicity of Twin Pregnancies : How Accurate is Intertwin Membrane?

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ABSTRACT

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Background: Prenatal determination of chorionicity by ultrasound has helped in bringing down the perinatal morbidity and mortality in twin pregnancies. In this study, the role of intertwin membrane thickness as a marker for ultrasound determination of chorionicity is being considered.

Materials & Methods: Antenatal chorionicity of twin pregnancies was determined using thickness of intertwin membrane as criteria in ultrasound. The gestational age at the time of assessment was documented. Postnatal confirmation of chorionicity was made by placental examination and compared with ultrasound chorionicity.

Results: Chorionicity was correctly determined in 92.9% of dichorionic twins and 71.4% of monochorionic twins when intertwin membrane thickness was taken as criteria. Also, when the chorionicity was assessed before 12 weeks, the accuracy was found to be greater.

Conclusions: Ultrasound assessment of chorionicity based on thickness of intertwin membrane is more accurate for dichorionic than monochorionic twin pregnancies. There is higher accuracy if ultrasound is performed in the first trimester.

Keywords: Intertwin Membrane, Chorionicity, Ultrasound, Twin Pregnancies

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BACKGROUND

Right from the first trimester, until delivery of the second foetus, the use of ultrasound in the management of twins is inevitable. Accurate and early determination of chorionicity is critical in the antenatal management of twins. Compared to dichorionic pregnancies, monochorionic pregnancies have a 3 to 5 fold higher morbidity and mortality.¹ Outcome of monochorionic pregnancies can be improved by intensive monitoring. Screening for and identification of aneuploidy, determination of etiology of foetal discordancy, early diagnosis of TTTS, management of structural anomalies, management of surviving twin following single foetal demise are examples of clinical management which depends on chorionicity.² Monoamniotic twins have a high mortality and morbidity and early intensive monitoring will improve outcome.³⁻⁵ Various studies on antenatal determination of chorionicity have been done by assessing the number of placental masses, foetal sex, presence and thickness

of intertwin membrane and the presence of twin peak sign.^{2,6} The membrane of a dichorionic pregnancy consists of 2 layers of chorion and 2 layers of amnion and hence is thicker than monochorionic-diamniotic membrane. If a membrane is not detected, possibility of a monoamniotic twinning has to be excluded.

MATERIALS AND METHODS

This was an observational study conducted in a tertiary care hospital in Trivandrum, Kerala State of India over a period of 1 year. 197 cases of twin pregnancies who had ultrasound before 20 weeks were included in the study. Twin pregnancies who were seen after 20 weeks gestation were excluded in the study. Diagnosis of chorionicity was made by transabdominal ultrasound examination. Presence or absence and the thickness of intertwin membrane, if present, were taken as the criteria for determination of chorionicity.

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Functional definitions: If the intertwin membrane was thick (>2mm), it was interpreted as dichorionic and if the membrane thickness was <2mm or absent, a diagnosis of monochorionicity was made. The gestational age at assessment of chorionicity was documented. These patients were followed up until delivery. The postnatal determination of chorionicity was made by examination of placenta for the number of layers in the separating membrane and compared with previous ultrasounds.

Ethical clearance was obtained from the Institutional Ethical Committee. The data entry were done by using Microsoft excel, and the data analysis was done by using SPSS.

RESULTS

There were a total of 15310 deliveries during this 1 year period of which 232 cases were twin pregnancies. The prevalence of twins was found to be 1.5%.

There were 197 cases of twins who had ultrasound before 20 weeks gestation. Among this 155 were dichorionic twins and 42 cases of monochorionic twins. Of the 155 cases of dichorionic twins, intertwin-membrane (ITM) was detected in 144 cases and of the 42 monochorionic twins, ITM was detected in 30 cases. Dichorionicity was diagnosed accurately in 92.9% cases, whereas monochorionicity was accurately diagnosed in only 71.4% cases. Relationship between presence of intertwin membrane and dichorionicity was found to be statistically significant (**Table 1**).

Thickness of ITM was measured, and thick ITM was detected in 90.3% cases on dichorionic twins. Monochorionic twins had a thin ITM in 80.3% cases. Thick intertwin membrane was significantly associated with dichorionicity (**Table 2**).

There were 145 cases with chorionicity assessment in the first trimester scan. Dichorionicity was accurately diagnosed in 92.9% cases and monochorionicity in 87.1% cases

There were 52 cases of twin pregnancies who had their first ultrasound taken between 12-20 weeks. Correct diagnosis of chorionicity was made in 83.3% cases of dichorionic and only 70% cases of monochorionic pregnancies during this period.

DISCUSSION

In this study, 197 cases of twin pregnancies with ultrasound diagnosis of chorionicity in the first half

Table 1. Detection of intertwin membrane in relation to chorionicity

Intertwin Membrane	Monochorionic(MC) %gestation	Dichorionic (DC) %gestation	Total (%gestation)
Not Detected	12 (28.6%)	11 (7.1%)	23 (11.7%)
Detected	30 (71.4%)	144 (92.9%)	174 (88.3%)
Total	42 (100%)	155 (100%)	197 (100%)
Chi Square = 14.78		P = 0.00012	

of pregnancy have been followed up till delivery. Assessment of chorionicity was on the basis of thickness of intertwin membrane where >2mm was considered thick. Of the 197 cases 155 were found to be dichorionic and 42 cases were monochorionic. Diagnosis of dichorionicity was accurate in 92.9% cases whereas for monochorionicity was 71.4% (**Table 1**). This shows that presence of thick intertwin membrane has a significant association with dichorionicity compared to monochorionicity.

Several other authors have assessed the accuracy of intertwin membrane as a marker for determination of chorionicity. Winn and colleagues, using membrane thickness as criteria reported an accuracy in predicting dichorionic and monochorionic gestation of 95% and 82% respectively.⁷ Studies by Carroll SG and associates demonstrated that thickness of intertwin membrane was significantly greater in the dichorionic compared to monochorionic. These findings were comparable to our study.⁸

Hertzberg et al, in his studies with ITM as the ultrasound marker got a sensitivity of 100% for dichorionic and specificity of 100% for monochorionic twins when ultrasound scans were done before 12 weeks.⁹ Studies by Kurtz et al also showed that there was 92% sensitivity for dichorionic and 88% sensitivity for monochorionic twins when ITM was taken as the marker in ultrasound.⁶

Carroll SG and associates demonstrated that there is a strong association between thickness of intertwin membrane and dichorionic pregnancies. Here the median thickness of ITM membrane was 2.2 mm in the dichorionic group and 0.9mm in the monochorionic group.⁸ Studies by Winn HN showed that

Table 2. Thickness of intertwin membrane in relation to chorionicity

Thickness	MC (%ge)	DC (%ge)	Total (%ge)
Thin	30 (83.3%)	15 (9.7%)	45 (23.6%)
Thick	6 (16.7%)	140 (90.3%)	146 (76.4%)
Total	36 (100%)	155 (100%)	191 (100%)
Chi Square 88.01		P = 0.0001	

Intertwin membrane	MC (%ge)	DC (%ge)	Total (%ge)
Detected	27 (87.1%)	106 (92.9%)	133 (91.7%)
Not Detected	4 (12.9%)	8 (7.0%)	12 (8.3%)
Total	31 (100%)	114 (100%)	145 (100 %)
Chi Square	1.112	P = 0.29	

membrane thickness of >2mm identifies dichorionicity with a PPV of 95% and monochorionic with PPV of 90% for a membrane thickness of <2mm.⁷ Considering both these studies, we have taken a 2mm thickness as a criteria for thick intertwin membrane in our study. In this study, a thick intertwin membrane (>2mm thickness) was detected in 140 of 155 dichorionic pregnancies with 90.3% accuracy and a thin ITM in 30 of 36 monochorionic pregnancies with accuracy of 83.3% cases (**Table 2**). In a study by Hertzberg BS, he concluded that it may be more appropriate to rely on subjective interpretation with membranes being considered thick if they were hyperechoic and thin if they were hair like instead of using a cutoff value for the thickness of intertwine membrane.⁹

Diagnosis of chorionicity is preferable in the first trimester as it potentiates the ability to put in place a programme for early second trimester ultrasound surveillance in monochorionic pregnancies. The highest rate of mortality in monochorionic pregnancies is before 24 weeks with antenatal evidence of TTTS in one third cases.¹⁰ Monoamniotic twinning has a perinatal mortality of 30-50% mainly due to cord entanglement and early diagnosis has counselling and management implications.¹¹⁻¹³

In this study, a comparison of first and second trimester ultrasound scans for the accuracy of diagnosis of chorionicity has been done. There were 145 cases of twins with ultrasound in the first trimester. Dichorionicity was accurately diagnosed in 92.9% cases and monochorionicity in 87.1% cases (**Table 3**). Of the 52 twin pregnancies who had their first ultrasound in the second trimester (12-20 weeks), 83.3% of dichorionic and 70% cases of monochorionic were diagnosed accurately (**Table 4**). This shows that first trimester ultrasound was more accurate when compared to the second trimester scan for the determination of chorionicity. Our findings are comparable to several studies done previously.

According to Stagiannis and colleagues, ultrasound evaluation of ITM is more accurate in the first

Intertwin membrane	MC (%ge)	DC (%ge)	Total (%ge)
Detected	7 (70 %)	35 (83.3%)	42 (80.8%)
Not Detected	3 (30%)	7 (16.7%)	10 (19.2%)
Total	10 (100%)	42 (100%)	52 (100.%)
Chi Square	0.924	P = 0.34	

half of pregnancy because foetuses are smaller.¹⁴ Several studies have suggested that determination of chorionicity is most accurate when performed before 14weeks gestation.¹⁵ Bajoria et al have concluded that chorionicity can be accurately assessed in 100% cases when performed before 13 weeks.¹ And if this window of opportunity is missed, chorionicity determination is still feasible by using composite ultrasound criteria of foetal sex, number of placentae, membrane thickness and twin peak sign with a sensitivity and specificity of > 91% +v predictive values of USG parameters in prediction of chorionicity.

According to a study conducted by Stenhouse et al with 131 twins, when chorionicity was assessed prior to 14 weeks gestation, the accuracy was 99% for both groups whereas in < 14weeks, sensitivity was 77% for monochorionic and 90% for dichorionic.¹⁶ There are studies that give different results. Scardo and associates, states that the ITM of twin pregnancies are so thin that it may not be visible until the second trimester.^{2,3} Studies show that it is easier to differentiate between monochorionic monoamniotic from monochorionic diamniotic twins after 8 weeks when the amniotic membrane becomes clearly visible.^{18,19}

Several studies comparing the accuracy of intertwin membrane thickness alone and a set of composite ultrasound markers for diagnosis of chorionicity has been done. In these studies, as intertwin membrane was taken as the main criteria, the accuracy was less compared to others where more than one criteria was taken. ITM as a parameter for diagnosis of

Criteria	Monochorionic	Dichorionic
Placenta	Single (42%)	Separate (98%)
Fetal Sex	Concordant (40%)	Discordant (100%)
Dividing memb	Absent – MCMA (100%)	Present
No. of layers	2 layers (94%)	4 layers (100%)
Thickness	<2mm (39-82%)	>2 (95%)
Twin peak sign	Not present (44%)	Present (100%)

chorionicity has a poor sensitivity to use of composite markers as there is high inter and intra observer variation^{9,14,20} When septal thickness alone is used as a measure, the overlap of standard deviations between monochorionic and dichorionic twins makes the assessment by this method suboptimal.¹⁴

Studies by Carroll SG and associates shows that when using a combination of sonographic signs between 10-14 weeks of gestation, there was a high degree of accuracy in determination of chorionicity and correct diagnosis was made in 99% cases. The most reliable indicator for dichorionicity was a combination of lamda sign or 2 separate placentae with a sensitivity and specificity of 97.4% and 100% respectively. Most useful test for predicting monochorionicity was the T- sign with a sensitivity of 100% and specificity of 100%. But measurement of ITM was found to be a less reliable indicator where the sensitivity for dichorionicity and specificity for monochorionicity was only 92.6%. They also found that first trimester ultrasound examination has a high accuracy in identifying chorionicity.⁸ Studies by Scardo et al using composite ultrasound markers showed a sensitivity and specificity for prediction of chorionicity of 91.7% and 97.3% respectively.²

CONCLUSION

Intertwin membrane thickness is a good ultrasound marker for determination of chorionicity in twin pregnancies. Thick intertwin membrane has strong association with dichorionicity than monochorionicity. But when taken alone, its accuracy is found to be suboptimal. Hence further studies are required to evaluate whether use of composite markers would be more appropriate rather than a single marker.

END NOTE

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