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Prenatal Sonographic Features of Trisomy 18

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ABSTRACT

Objective To evaluate the sonographic characteristics of the fetuses with trisomy 18.

Design Descriptive analysis.

Setting Department of Obstetrics and Gynaecology, Faculty of Medicine, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai University.

Subjects The fetuses proven to be trisomy 18 were sonographically evaluated.

Results Twenty proven cases of trisomy 18 were evaluated by prenatal ultrasound. The indications for sonographic examinations included amniocentesis or cordocentesis due to genetic risk, large-or small-for-date and screening anomalies. Fifteen of twenty had two or more abnormal findings. There were only two cases that no abnormality could be seen. The common sonographic findings included abnormal head shape, abnormalities of extremities, choroid plexus cyst, enlarge cisterna magna, cardiac abnormalities, omphalocele, intrauterine growth retardation and polyhydramnios.

Conclusion Nearly all fetuses with trisomy 18 had abnormal sonographic findings in second or third trimester. Most of them had two or more abnormalities. Although prenatal ultrasound can not permit us to make a definite diagnosis of trisomy 18, it has characteristic pattern of multiple malformations in most cases and warrants cytogenetic testing.

Key words : Trisomy 18, prenatal diagnosis, ultrasound

Trisomy 18 is one of the most common autosomal disorders with a prevalence of 0.3% of newborns. It was first recognized as a specific entity in 1960 by Edward et al.[1,2] The great majority of cases have full 18 trisomy chromosome, the result of faulty chromosomal dis-

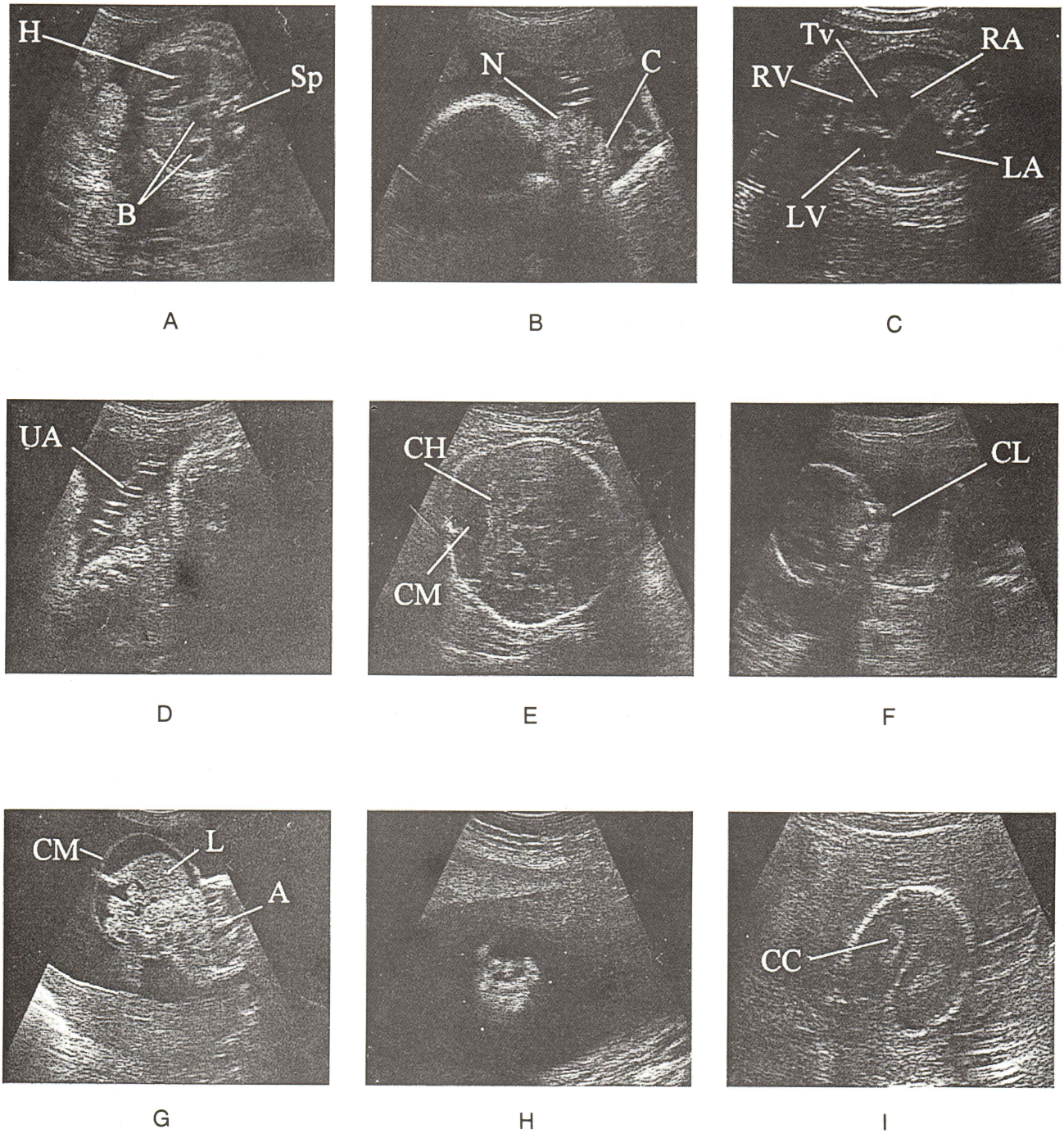

Fig. 1. Sonographic images of trisomy 18 show diaphragmatic hernia (A), micrognathia (B), Ebstein's anomaly (C), single umbilical artery ; UA (D), dilated cisterna magna ; CM (E), cleft lip ; CL (F), omphalocele (G), overlaping fingers (H) and choroid plexus cyst ; CC (I). (H = heart, Sp = spine, B = bowel, N = nose, C = chin, RV = right ventricle, RA = right atrium, LA = left atrium, LV = left ventricle, Tv = tricuspid valve, CH = cerebral hemisphere, CM = covering membrane, L = liver, A = abdomen).

tribution, which is most likely to occur at older maternal age ; the mean maternal age at birth of babies with this syndrome is 32 years. The prognosis of fetuses with trisomy 18 is uniformly poor. Among all undiagnosed cases, premature deliveries, intrauterine demise or stillbirths are common ; it is estimated that 50-90% of fetuses alive at 16 weeks will not survive to livebirth.[3] The median survival for infants born with trisomy 18 is 5 days, with a mean of 48 days.[4]

The common characteristic findings of trisomy 18 include IUGR, loose skin, hypoplasia of skeletal muscles, microcephaly, micronathia, clenched hand with overlaping fingers, cardiovascular malformations, small placenta, single umbilical artery and diminished fetal activity.[1] Furthermore, over 130 abnormalities involving virtually every organ system have been described in conjunction with trisomy 18. However, the pattern of congenital abnormalities may suggest a diagnosis of trisomy. The objective of this study is to evaluate sonographic features of second trimester fetuses with trisomy 18.

Materials and Methods

This descriptive analysis (case series) was undertaken at the Department of Obstetrics and Gynaecology, Faculty of Medicine, Chiang Mai University, Thailand. The subjects were recruited from pregnant women who underwent prenatal sonographic examinations with various indications. The inclusion criteria was that fetuses had to be proven of trisomy 18 by either amniocentesis, cordocentesis or postnatal chromosome studies.

All ultrasonographic examinations were performed by the authors from June 1989 to March 1997, using convex transducers (Aloka Model 650 or 680). Indications for ultrasonographic examinations were divided into two categories 1) sonographic evaluation before amniocentesis or cordocentesis due to genetic risk and 2) other various obstetric indications including uncertain date, large-or small-for-date, fetal anomaly screening etc.

Results

Twenty cases of trisomy 18 were diagnosed and followed by the authors. Ten pregnancies with an obvious genetic risk underwent amniocentesis or cordocentesis. These fetuses were carefully examined by ultrasound either before or after the diagnosis of trisomy 18 was known. The remainders were sonographically evaluated due to other various indications without genetic risk.

The demographic informations and sonographic findings are presented in tables I and II respectively. The majority of cases had no obstetric complication. The maternal age ranged from 23 to 43 years and the mean age was 31.7 years. Sixty-five percent were multiparous. The mean gestatinal age at time of diagnosis was 22.55 weeks with a range of 14-38 weeks. Therapeutic termination was done in all cases after proper counseling.

The most common sonographic abnormalities were abnormal-shaped head (strawbery-shaped, brachycephaly) and abnormalities of extremities (rocker-bottom, clenched hand, clubfoot). Other common abnormalities (15% or more) included choroid plexus cyst, enlarged cisterma magna, micrognathia, facial cleft, cardiac abnormalities (VSD, ASD, hypoplastic left heart), omphalocele, ventriculomegaly, diaphragmatic hernia, polyhydramnios, oligohydramnios, single umbilical artery and symmetric intrauterine growth retardation (IUGR).

Eight fetuses developed symmetric IUGR but could be prenatally diagnosed in only 6 cases, another 2 fetuses could not be detected

due to omphaloceles. All six fetuses diagnosed as IUGR were seen after 20 weeks and all had polyhydramnios as well. Fifteen of the 20 cases had two or more abnormal findings. Three cases had only one abnormality (omphalocele, choroid plexus cyst, holoprosencephaly). There were only two cases that abnormalities could not be seen at all and both were evaluated at time of amniocentesis (16 and 18 weeks of gestation).

Discussion

Although ultrasound has some limitation in demonstrating some common abnormalities of trisomy 18 such as short sternum,[2] this series indicates that the sonographic pattern of specific congenital anomalies may suggest a diagnosis of trisomy 18. The common abnormal findings in this study included abnormal head shape, abnormalities of extremities (clubfoot, clenched hand,

Table 1. Baseline characteristic of the patients

No.	Ages	Parity	Weeks of diagnosis	Indications for Ultrasound examination
1	38	2-0-1-2	16	Amniocentesis for genetic study
2	43	3-0-0-2	18	Amniocentesis for genetic study
3	36	1-0-1-1	21	Amniocentesis for genetic study
4	40	2-0-2-2	17	Amniocentesis for genetic study
5	39	0-0-1-0	18	Amniocentesis for genetic study
6	26	2-0-0-2	17	Amniocentesis for genetic study
7	35	1-0-1-1	22	Cordocentesis for genetic study
8	35	0-0-0-0	20	Cordocentesis for genetic study
9	24	1-0-1-0	21	Cordocentesis for genetic study
10	37	0-0-0-0	20	Cordocentesis for genetic study
11	23	1-1-0-1	24	Rule out anomaly
12	25	0-0-0-0	26	Large-for-date
13	22	1-0-1-1	28	Large-for-date
14	28	0-0-0-0	14	Amniocentesis for genetic study
15	31	1-1-0-1	15	Uncertained date
16	28	1-0-2-1	28	Small-for-date
17	36	0-0-0-0	32	Antepartum hemorrhage
18	36	2-0-1-1	36	Rule out anomaly
19	32	3-0-1-3	38	Large-for-date
20	20	0-0-0-0	20	Uncertained date

Table 2. Sonographic abnormalities in 20 fetuses with trisomy 18

	n	(%)
Skull/Brain		
Strawberry-shaped head	6	(30)
Brachycephaly	6	(30)
Ventriculomegaly	3	(15)
Holoprosencephaly	1	(5)
Choroid plexus cyst	3	(15)
Enlarged cisterna magna	4	(20)
Face/Neck		
Facial cleft	3	(15)
Micronathia	3	(15)
Cystic hygroma	1	(5)
Nuchal edema	1	(5)
Hypotelorism	1	(5)
Chest		
Diaphragmatic hernia	3	(15)
Cardiac abnormalities	5	(25)
Abdomen		
Omphalocele	6	(30)
Absent stomach	2	(10)
Mild hydronephrosis	2	(10)
Others		
Intrauterine growth retardation	6	(30)
Polyhydramnios	6	(30)
Oligohydramnios	3	(15)
Abnormal hands/feet	8	(40)
Umbilical cord cyst	2	(10)
Single umbilical artery	3	(15)

rocker-bottom), choroid plexus cyst, enlarged cisterna magna, cardiac defects, diaphragmatic hernia, omphalocele, polyhydramnios, oligohydramnios, symmetric intrauterine growth retardation. Most findings are consistent with those reported in previous studies.[5-7]

When any of the findings described above is found, consideration should be given to the possibility of trisomy 18 and a careful anatomic survey to look for additional sonographic signs of this trisomy should be conducted. Our data showed that most fetuses had multiple abnormalities but the number and severity are highly variable. It is difficult for this small series to

specify which abnormality is the best predictor, but the more abnormal findings, the more chances to be the syndrome. However, Marion and associates[8] developed a clinical scoring system to aid the neonatal diagnosis of trisomy 18. Specific congenital abnormalities are given points depending on the frequency with which they are present in trisomy 18. Benacerraf and associates[6] reported that 12 of 15 fetuses (80%) with trisomy 18 had one or more of the following sonographically detectable abnormalities : polyhydramnios, congenital heart disease, diaphragmatic hermia and omphalocele. Eleven of the 12 fetuses with trisomy 18 had abnormalities of the hands or feet. Nyberg and associates[5] reported extremity abnormalities in 29 of 35 (83%) trisomy 18 fetuses.

Abnormality could not be demonstrated at all in some cases of trisomy 18 in this series. All of them were diagnosed and terminated before 20 weeks. It is possible that some abnormal sonographic findings might have appeared later if they had been followed until late pregnancies. The finding indicates that normal sonographic evaluation can not absolutely exclude the possiblity of this syndrome especially in the first half of pregnancy. However, we can conclude that nearly all cases of trisomy 18 showed some abnormal sonographic features and most of them had multiple abnormalities. This finding is consistent with other studies.[5,6] In two separate series of trisomy 18 fetuses, prenatal sonographic findings were detected in about 80% of cases and in all 18 fetuses examined after 24 weeks' gestation.[5,6]

We found that some minor abnormalities, including choroid plexus cyst, club foot, mild hydronephrosis, polyhydramnios, oligohydramnios, single umbilical artery, were always demonstrated in conjunction with other abnormal findings. Therefore, it is unclear whether these isolated abnormalities are strong enough to perform invasive genetic testing or not. However, they should undoubtedly be regarded as indications for detailed ultrasound assessment. For major or multiple malformations, cytogenetic study should always be done.

Cardiac malformation is nearly always present with trisomy 18, but we could demonstrate in only 40 percent of cases. This may be due to the fact that many minor heart lesions were difficult to visualize in some cases. Because of a high prevalence of heart defects in trisomy 18, fetal echocardiography plays an important role in this condition and should be obtained whenever a major structural abnormality is detected.[9]

Interestingly, we found two cases of umbilical cord cyst in late second trimester which was rarely mentioned elsewhere. Generally cord cysts resolve by the begining of the second trimester in most cases and are not associated with chromosomal abnormalities.[10] Micrognathia is one of the most common abnormalities in trisomy 18.[2] However, we can demonstrate in only 3/20. This may be due to the fact that we could not always demonstrate facial profile view especially in cases of oligohydramnios or poor facial position. In addition, a sonographic criteria for diagnosis of this condition is still subjective. It may be difficult to diagnose in cases of minor degree.

Intrauterine growth retardation (symmetric) was found in only 6 cases (30%), when compared to 87% in neonates and stillborn series.[11] This discrepancy may be due to the fact that most fetuses in our series were diagnosed before 22 weeks when IUGR is not obvious yet. We observed that all fetuses with symmetric IUGR had polyhydramnios as well. Therefore, the combination of symmetrical IUGR and polyhydramnios should suggest the possibility of this trisomy.

In conclusion, nearly all fetuses with trisomy 18 had abnormal sonographic findings in the second or third trimester. Most of them had two or more abnormalities. The suggestive findings included strawberry-shaped head, choroid plexus cysts, enlarged cisterna magna, facial cleft, micrognathia, nuchal edema, heart defects, daphragmatic hernia, esophageal atresia, ompha locele, renal defects, growth retardation and shortening of the limbs, radial aplasia, overlaping fingers and talipes or rocker-bottom feet. Although prenatal ultrasound can not permit us to make a definite diagnosis of trisomy 18, it has a characteristic pattern of multiple malformations in most cases and warrants cytogenetic testing.

References

1. Edwards MT, Smith WL, Hanson J. A new trisomic syndrome. Lancet 1960 ; 1 : 787.
2. Jones KL. Smith's recognizable patterns of human malformation. 5th ed. Philadelphia : W.B. Saunders, 1997 ; 14-5.
3. Hook EB. Chromosome abnormalities and spontaneous fetal death following amniocentesis : Further data and associations with maternal age. Am J Hum Genet 1983 ; 35 : 110.
4. Carter PE, Pearn JH, Bell J, et al. Survival in trisomy 18. Life tables for use in genetic counselling and clinical paediatrics. Clin Genet 1986 ; 27 : 59.
5. Nyberg DA, Kramer D, Resta RG, et al. Prenatal sonographic findings of trisomy 18 : Review of 47 cases. J Ultrasound Med 1993 ; 2 : 103.
6. Benacerraf BR, Miller WA, Frigoletto FD. Sonographic detection of fetuses with trisomies 13 and 18 ; Accuracy and limitations. Am J Obstet Gynecol 1988 ; 158 : 404.
7. Wladimiroff JW, Stewart PA, Reuss A, Sachs ES. Cardiac and extra-cardiac anomalies as indicators for trisomies 13 and 18 : A prenatal ultrasound study. Prenat Diagn 1989 ; 9 : 515.
8. Marion RW, Chitayat D, Hutcheon RG, et al. Trisomy 18 score : A rapid, reliable diagnostic test for trisomy 18. Pediatrics 1988 ; 113 : 45.
9. Fogel M, Capel JA, Cullen WT, et al. Congenital heart disease and fetal thoracoabdominal anomalies : Assoiciations in utero and the importance of cytogenetic analysis. J Perinatol 1991 ; 8 : 411.
10. Skibo LK, Lyons EA, Levi CS. First-trimester umbilical cord cysts. Radiology 1992 ; 182 : 719.
11. Tyson RW, Kalousek DK. Chromosomal abnormalities in stillbirth and neonatal death. In : Dimmick JE, Kalousek DK, eds. Developmental pathology of the embryo. Philadelphia : JB Lippincott, 1992 ; 145.