Basic or detailed morphology scan in mid-trimester?

KY Leung *, MD, FRCOG

Private Practice, Hong Kong SAR, China

* Corresponding author: ky@kyleung.org

This article was published on 16 Apr 2024 at www.hkmj.org.

Hong Kong Med J 2024;30:176–8
https://doi.org/10.12809/hkmj2310772

Introduction

The mid-trimester morphology scan (MTMS) has been the standard of care for several decades, allowing prenatal detection of fetal abnormalities and opportunities for further genetic testing and management.[1,2] Despite the increasing use of cell-free DNA testing and advances in first-trimester anomaly detection, the MTMS still has a role in screening for fetal abnormalities, the incidence of which is 2% to 3%.[2,3] About 54% of fetal abnormalities can be detected on an MTMS but not on the first-trimester scan[4]; examples include absent corpus callosum, cerebellar hypoplasia, congenital diaphragmatic hernia, and heart defects.[5]

Around 20% to 40% of major anomalies may be missed in the MTMS,[5] with the result being potential medico-legal consequences. To maximise the detection rate, a standard anatomic survey protocol, among other measures, should be used.[1,2] The Hong Kong College of Obstetricians and Gynaecologists included both minimal and optimal standards of MTMS in the guidelines on antenatal care published in 2008.[6] In 2011, the International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) published its guidelines on the minimal requirements for MTMS,[1] which have been widely adopted. In recent years, updated guidelines have been published by the ISUOG and other societies due to increasing clinical need, expertise of operators, expectations of pregnant patients, and advances in ultrasound technology.[2,5,7-9]

New elements in the updated guidelines on the basic mid-trimester morphology scan

In the updated 2022 ISUOG guidelines, eight and three fetal structures/elements were added to the basic and optional (if technically feasible) examinations, respectively (online supplementary Table).[1,2] The total elements recommended in this updated version exceed two of three other international guidelines (online supplementary Table).[1,2,7-9] For the basic examination, falx, thalami, orbits/eyes, left and right outflow tracts, three vessel/three vessel trachea view, left cardiac chamber, and lung should be checked.[2] For the optional examination, the appearance of the external genitalia can be checked, though sex determination is not routine.[2] The gallbladder can be assessed,[2] as non-visualisation can be a feature of biliary atresia. The nasal bone, as part of the median facial profile, can also be checked.[2] Additional time, effort, and skills are required to complete these additional examinations either by sliding along the common standard scanning planes or using additional planes.[1,2]

The MTMS can be performed up to 23 weeks and 6 days in the updated guidelines, compared with 22 weeks in the 2011 guidelines.[1,2] Delaying the MTMS until 22 to 23 weeks may improve the success rate, especially in obese patients, but could also delay the diagnosis of major fetal abnormalities, thereby limiting management options.[5] The legal gestational limit for termination of pregnancy in Hong Kong is 24 weeks.

Ultrasound operators should have undergone specialised training for performing the MTMS. The updated guidelines further specify that local regulations should be followed for training, maintenance of skills, and certification.[1,2] In the opinion of the author, these quality assurance activities should be strengthened at the local level.

Transabdominal transducers should have suitable resolution and penetration in the 2- to 9-MHz range, according to the updated ISUOG guidelines, compared with a range of 3 to 5 MHz in the 2011 guidelines.[1,2] Colour and pulsed Doppler are added as desirable features in the updated guidelines to facilitate detection of pulmonary or aortic stenosis with abnormal blood flow patterns, especially in obese patients.[2,10-12]

Differences between basic and detailed mid-trimester morphology scans

A basic MTMS is used in pregnant patients who do not have any maternal, fetal, or obstetric risk factors.[1,2] A detailed MTMS provides a comprehensive examination in those with known risk factors, including a known or suspected fetal anatomic abnormality, known fetal growth disorder, genetic abnormality, or increased risk for a fetal anatomic or genetic abnormality.[9] Common examples leading to high risk include maternal age ≥35 years, gestational diabetes, conception via assisted reproductive

technology, body mass index ≥30 kg/m^2, fetal exposure to teratogens, and nuchal translucency ≥3 mm.[9]

Compared with the basic MTMS, a detailed MTMS (as recommended in the American Institute of Ultrasound in Medicine guidelines) includes examination of 28 fetal structures/elements (online supplementary Table).[1,2,9] Whether some or all of these elements need to be examined depends on the indication for the examination and the findings during the examination[9]; for example, examination of the palate is required when a cleft lip is found. The majority of these fetal structures can be evaluated by two-dimensional ultrasound, though three-dimensional ultrasound may provide additional findings in the evaluation of palate, ear, and ribs.[5,13,14]

Basic mid-trimester morphology scan and beyond

During routine antenatal care, any risk factors should be carefully assessed and documented on an ultrasound request form (if applicable). However, some risk factors may be missed or undisclosed. Although a routine MTMS can be performed in pregnant patients without these risk factors, a more comprehensive evaluation is encouraged if time, equipment, and skills allow.[2] If an MTMS cannot be performed completely and in accordance with adopted guidelines, the reasons for this should be documented. A prompt re-scan or referral to another examiner is required, as abnormalities are subsequently found in 0.5% to 5% of such cases.[2]

A detailed MTMS should be offered to those with relevant risk factors.[2] Alternatively, it is appropriate to perform a routine MTMS first and then arrange for a more detailed scan to be conducted by an experienced specialist.[2] For example, if the patient already has a child with a brain or heart anomaly, fetal neurosonography or echocardiography should be performed as appropriate.[15-17]

Fetal neurosonography involves a systematic evaluation of the brain by a continuum of sagittal and coronal planes, preferably using a transvaginal approach.[15,16] The fetal echocardiogram is a detailed evaluation of cardiac structure and function that involves sequential segmental analysis of the situs, atria, ventricles, and the great arteries and their connections.[17] The evaluation of the brain and heart in these targeted examinations is more systematic and comprehensive than the elements examined in a detailed MTMS.[9,15-17]

When there are abnormal or suspicious findings, a comprehensive evaluation of fetal morphology, not limited to the elements listed in a detailed MTMS, is recommended.[5,9] For example, if an abnormality is suspected or found in the umbilical portion of the left portal vein and portal sinus while the abdominal circumference is being measured, a targeted examination of the precordial venous system is required.[18] Even when a detailed MTMS shows normal findings, an additional scan may be required in the third trimester of some complex pregnancies to detect late-onset fetal abnormalities, such as microcephaly, ventriculomegaly, or coarctation of aorta.[19] False-positive results, including subtle features, can cause maternal anxiety.[5] When the diagnosis is uncertain, reassessment by an experienced specialist is required before making a definitive diagnosis and discussing management options. The limitations of a basic or a detailed MTMS in the detection of fetal abnormalities should be explained to the patient.

In conclusion, adoption of the updated guidelines on MTMS should be considered to improve the prenatal detection of fetal abnormalities, though it should be noted that extra time, effort, and skills are required. While a basic MTMS can be performed in pregnant patients without risk factors, a more detailed examination should be performed when risk factors or abnormal or suspicious scan findings are identified.

Author contributions

The author contributed to the concept or design, acquisition of data, analysis or interpretation of data, drafting of the commentary, and critical revision of the commentary for important intellectual content. The author had full access to the data, contributed to the study, approved the final version for publication, and takes responsibility for its accuracy and integrity.

Conflicts of interest

As an editor of the journal, the author was not involved in the peer review process.

Funding/support

This commentary received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Supplementary material

The supplementary material was provided by the author and some information may not have been peer reviewed. Any opinions or recommendations discussed are solely those of the author and are not endorsed by the Hong Kong Academy of Medicine and the Hong Kong Medical Association. The Hong Kong Academy of Medicine and the Hong Kong Medical Association disclaim all liability and responsibility arising from any reliance placed on the content. To view the file, please visit the journal online (https://doi.org/10.12809/hkmj2310772).

References

1. Salomon LJ, Alfirevic Z, Berghella V, et al. Practice guidelines for performance of the routine mid-trimester fetal ultrasound scan. Ultrasound Obstet Gynecol 2011;37:116-26.
2. Salomon LJ, Alfirevic Z, Berghella V, et al. ISUOG Practice Guidelines (updated): performance of the routine mid-

trimester fetal ultrasound scan. Ultrasound Obstet Gynecol 2022;59:840-56.
3. Crane JP, LeFevre ML, Winborn RC, et al. A randomized trial of prenatal ultrasonographic screening: impact on the detection, management, and outcome of anomalous fetuses. The RADIUS Study Group. Am J Obstet Gynecol 1994;171:392-9.
4. Syngelaki A, Hammami A, Bower S, Zidere V, Akolekar R, Nicolaides KH. Diagnosis of fetal non-chromosomal abnormalities on routine ultrasound examination at 11-13 weeks' gestation. Ultrasound Obstet Gynecol 2019;54:468-76.
5. Edwards L, Hui L. First and second trimester screening for fetal structural anomalies. Semin Fetal Neonatal Med 2018;23:102-11.
6. The Hong Kong College of Obstetricians and Gynaecologists. HKCOG Guidelines. Guidelines on Antenatal Care (Part II). September 2008. Available from: https://www.hkcog.org.hk/hkcog/Download/Guidelines_on_Antenatal_Care_%28Part_II%29_2008.pdf. Accessed 10 Apr 2024.
7. Leung KY, Poon CF, Teotico AR, et al. Recommendations on routine mid-trimester anomaly scan. J Obstet Gynaecol Res 2015;41:653-61.
8. Australasian Society for Ultrasound in Medicine. Guidelines for the performance of second (mid) trimester ultrasound. February 2018. Available from: https://www.asum.com.au/files/public/SoP/curver/Obs-Gynae/Guidelines-for-the-Performance-of-Second-Mid-Trimester-Ultrasound.pdf. Accessed 1 Mar 2023.
9. AIUM Practice Parameter for the performance of detailed second- and third-trimester diagnostic obstetric ultrasound examinations. J Ultrasound Med 2019;38:3093-100.
10. International Society of Ultrasound in Obstetrics and Gynecology; Carvalho JS, Allan LD, et al. ISUOG Practice Guidelines (updated): sonographic screening examination of the fetal heart. Ultrasound Obstet Gynecol 2013;41:348-59.
11. Nadel AS. Addition of color Doppler to the routine obstetric sonographic survey aids in the detection of pulmonic stenosis. Fetal Diagn Ther 2010;28:175-9.
12. Paladini D. Sonography in obese and overweight pregnant women: clinical, medicolegal and technical issues. Ultrasound Obstet Gynecol 2009;33:720-9.
13. Tutschek B, Blaas HK, Abramowicz J, et al. Three-dimensional ultrasound imaging of the fetal skull and face. Ultrasound Obstet Gynecol 2017;50:7-16.
14. Gindes L, Benoit B, Pretorius DH, Achiron R. Abnormal number of fetal ribs on 3-dimensional ultrasonography: associated anomalies and outcomes in 75 fetuses. J Ultrasound Med 2008;27:1263-71.
15. Malinger G, Paladini D, Haratz KK, Monteagudo A, Pilu GL, Timor-Tritsch IE. ISUOG Practice Guidelines (updated): sonographic examination of the fetal central nervous system. Part 1: performance of screening examination and indications for targeted neurosonography. Ultrasound Obstet Gynecol 2020;56:476-84.
16. Paladini D, Malinger G, Birnbaum R, et al. ISUOG Practice Guidelines (updated): sonographic examination of the fetal central nervous system. Part 2: performance of targeted neurosonography. Ultrasound Obstet Gynecol 2021;57:661-71.
17. AIUM Practice Parameter for the performance of fetal echocardiography. J Ultrasound Med 2020;39:E5-16.
18. Yagel S, Cohen SM, Valsky DV, Shen O, Lipschuetz M, Messing B. Systematic examination of the fetal abdominal precordial veins: a cohort study. Ultrasound Obstet Gynecol 2015;45:578-83.
19. Ficara A, Syngelaki A, Hammami A, Akolekar R, Nicolaides KH. Value of routine ultrasound examination at 35-37 weeks' gestation in diagnosis of fetal abnormalities. Ultrasound Obstet Gynecol 2020;55:75-80.