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GUIDELINES

Biophysical Profiling in Diabetic Pregnancies

Antenatal biophysical profiling, particularly ultrasound examination, plays an important role in the monitoring of diabetic pregnancies. The main issues associated with the sonographic assessment of these pregnancies include the following:

- 1. Assessment of gestational age*
- 2. Detection of congenital anomalies*
- 3. Surveillance of growth*
- 4. Dynamic assessment of fetal status (BPS, Doppler)*

The biophysical assessment protocol in pregnancies complicated by diabetes will vary according to whether the pregnancy is one complicating Pre-existing Diabetes Mellitus (*PreDM*) or whether the diabetes has developed during the pregnancy (*GDM*).

1. Gestational age determination

Evaluation of gestational age is extremely important for accurate monitoring of the advancing pregnancy. Estimation of gestational age should be performed in the first trimester of pregnancy, preferably, using TVS (trans-vaginal sonography) when CRL measurement would be the

best parameter. A second dating ultrasonographic estimation using an abdominal scan should be made in the mid-second trimester.

2. Congenital anomalies

With current care, the main contributor to perinatal mortality and morbidity in patients with PreDM, whether IDDM or NIDDM, is congenital malformations of the fetus. The diabetic embryopathy occurs early in the first trimester affecting multi-organ systems including the nervous, cardio-vascular, skeletal, genitourinary and GIT systems. GDM develops after the second trimester and hence is not associated with embryopathies.

Surveillance for congenital anomalies should be started as early as possible preferably using a trans-vaginal examination at 14-15 weeks of pregnancy. This should be followed up by a mandatory second trimester scan with careful assessment and documentation of the cranium and brain, spine, stomach, bladder, kidneys and insertion of the umbilical cord. A four-chamber view of the heart must be studied, though detailed fetal echocardiography is best performed by a skilled pediatric cardiologist.

3. Fetal growth analysis

Fetal growth monitoring remains an inexact process with a 15% error when using ultrasound serial measurement of fetal growth parameters. The main purpose of careful assessment of fetal growth is the detection of fetal macrosomia and IUGR. All pregnant diabetic patients should undergo ultrasound growth assessments of the fetus every 3-4 weeks, starting at around 20 weeks of pregnancy for PreDM patients and at the

time of diagnosis for GDM patients. The measurements can be correlated together by plotting estimated fetal weight.

The macrosomic fetus will be identified with a positive predictive value of >90% when the estimated fetal weight or any of the growth parameters (usually abdominal circumference) lies above the 95th percentile. In patients with pre-IDDM, macrosomia may be more apparent in selected fetal structures such as the liver, subcutaneous fat, soft tissues of arm, thigh and cheeks. These variables (selective organomegaly) are potentially measurable and may aid in predicting early development of macrosomia. IUGR is associated with conditions that predispose to uteroplacental insufficiency, and therefore is most likely to appear in pre-DM complicated by severe vasculopathy.

4. Assessment of fetal well-being

Dynamic assessment of the fetus of diabetic mothers implies the use of Biophysical Score (Manning) and Doppler studies. The standard Manning score is often applied to evaluate the present well-being of the fetus; but in diabetes must be modified to take into account increased liquor volume reflecting a relative polyhydramnios.

FETAL VARIABLE (scan x 30 min)	Normal (score = 2)	Abnormal (score = 0)
◆ Fetal breathing	1+ episode of 30 sec duration	Absent
◆ Fetal movement	3+ discrete body or limb movements	<3 movements
◆ Fetal tone	1+ episode of active extension -flexion	Slow or no extension or flexion
◆ Liquor volume	1+ pocket diameter >1 to <7 cm	Pockets <1 or >7 cm
◆ NST	2+ reactions of FHR to movement	No FHR reactions

The Manning Score may serve as an important tool for fetal surveillance, especially in order to prevent unnecessary early interventions, thereby allowing prolongation of pregnancy beyond 37 weeks. It must be remembered that because of the predisposition of macrosomia resulting from excessive fuel metabolism in diabetic gravidas, uteroplacental insufficiency may be difficult to detect by simple ultrasound assessment of fetal growth. For this reason Manning score should be carried out on a weekly basis in pre-DM or insulin-dependent GDM pregnancies from 32-34 weeks.

Doppler umbilical artery velocimetry has been proposed as a useful clinical tool for fetal surveillance in pregnancies at risk for placental vascular disease. The data remains conflicting and it appears that umbilical artery waveforms indices of non-complicated diabetic are not different from those in normal controls.

Proposed ultrasound work-up in DM complicating pregnancy

	<i>Gestational DM</i>	<i>Pre-existing DM</i>
<i>1st trimester</i>		<ul style="list-style-type: none"> ◆ 8-10 wks – TVS dating of pregnancy (CRL). ◆ 12 wks – Nuchal translucency (optional).
<i>2nd trimester</i>		<ul style="list-style-type: none"> ◆ 15 wks – Transvaginal first detailed anatomical survey of the fetus (optional). ◆ 22 wks – Second detailed anatomical survey of the fetus (abdominal). ◆ 20-24 wks – Fetal echocardiography
<i>3rd trimester</i>	<ul style="list-style-type: none"> ◆ Fetal growth and weight estimations at diagnosis and every 3-4 wks ◆ Manning Score at 34 wks and weekly thereafter for insulin treated patients 	<ul style="list-style-type: none"> ◆ Fetal growth and weight estimations starting at 20 wks, at 3-4 wks intervals. ◆ Manning score at weekly intervals starting at 32-34 wks

<h1 style="text-align: center;">ULTRASOUND</h1> <h2 style="text-align: center;">DIABETIC PREGNANCIES</h2>	Patient Identification: Name: _____ ID No.: _____ Date: _____
Diagnosis Pre-IDDM [___] Pre-NIDDM [___] GDM on Insulin [___] GDM on diet only [___] 2hr oGTT _____	Clinical Data Patient's Age: _____ Parity: ____ + ____ LMP: _____ Gestation: ____ wks
Assessment of gestational age <u>1st trimester</u> ♦ Crown-Rump: _____ = _____ wks	<u>2nd trimester</u> ♦ BPD: _____ = _____ wks ♦ Femur length: _____ = _____ wks ♦ AC: _____ = _____ wks
Congenital anomalies Neural [___] _____ Cardiac [___] _____	Stomach [___] _____ Urinary [___] _____
<u>3rd trimester</u> Surveillance of growth Estimated fetal weight: _____ gm	BPD: _____ = _____ wks Femur length: _____ = _____ wks AC: _____ = _____ wks
Biophysical Profile ♦ Breathing _____ [___] ♦ Movement _____ [___] ♦ Tone _____ [___] ♦ Liquor volume _____ [___] ♦ NST _____ [___]	Doppler ♦ AB Ratio _____ % centile ♦ RI _____ % centile
Office Use Only: Assessor: Date: _____	