Intrauterine Growth Restriction (IUGR)

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Preamble

Guidelines outline recommendations, informed by both the best available evidence and by midwifery philosophy, to guide midwives in specific practice situations and to support their process of informed decision-making with clients. The midwifery philosophy recognizes the client as the primary decision maker in all aspects of her care and respects the autonomy of the client (1).

The best evidence is helpful in assisting thoughtful management decisions and may be balanced by experiential knowledge and clinical judgment. It is not intended to demand unquestioning adherence to it's doctrine as even the best evidence may be vulnerable to critique and interpretation.

The purpose of practice guidelines is to enhance clinical assessment and decision-making in a way that supports practitioners to offer a high standard of care. This is supported within a model of well-informed, shared decision-making with clients in order to achieve optimal clinical outcomes.

Understanding Fetal Growth

Fetal growth has four primary determinant factors (2)(3):

1. External environment and extrinsic factors
2. Maternal factors
3. Placental factors
4. Fetal factors

Fetal growth in the first half of pregnancy is largely determined by the fetal genome, whereas in later pregnancy maternal, hormonal, environmental, and pathological determinants become increasingly influential (3).

There is a wide range of normal fetal growth velocity in the second half of gestation, as has been demonstrated through studies employing a sonography to analyze growth velocity (3). It is important for the midwife to be able to distinguish between the fetus which is constitutionally small and the fetus which is at risk for adverse outcome due to IUGR.

Definitions

A reasonable working definition for a small for gestational age (SGA) fetus is "having weight either below the tenth centile or below the population mean minus two standard deviations" (4). The Royal College of Obstetricians and Gynaecologists (RCOG) guideline examined the use of biometrical measurements for the determination of fetal growth and concluded that either the use of the single measurement of abdominal circumference (AC) or the total of estimated fetal weight (EFW) using one of the established logarithms (e.g. Hadlock) be used (5).

Between 24-70% of fetuses who are SGA (<10%ile for AC or EFW) are normally grown when maternal factors such as ethnicity, height, weight, and parity are accounted for (6)(7)(5). The majority of fetuses who are identified as SGA do not have an increased risk for morbidity or mortality (5). Further, it is possible that a fetus who is >10%ile for AC or EFW is growth restricted (5). The use of customized fetal growth charts are of benefit distinguishing the constitutionally small from the growth restricted (5)(8). The program for customized fetal growth charts can be obtained from www.gestation.net

The challenge for the midwife is to identify those women with constitutionally small yet normally grown fetuses from those with restricted-growth fetuses and hitherto undiagnosed underlying pathology, often placental in origin (8)(2).

While most IUGR fetuses are SGA, many SGA fetuses are not IUGR. IUGR fetuses are often, yet not necessarily, <10%ile for AC or EFW (some alternatively propose the 5th, 3rd and 2.5th %ile) and, most importantly, fail to reach growth potential as exhibited by slowed or halted growth on serial ultrasounds, and demonstrate stress from impaired exchange across the maternal-placental interface, such as alterations in umbilical artery or middle cerebral artery Doppler studies (8)(9)(10)(5)(3)(2).

SYMMETRICAL VERSUS ASYMMETRICAL

In 1977, Campbell and Thoms first described a distinction between those fetuses who exhibited symmetrical versus those with asymmetrical growth restriction based on the ratio of head circumference (HC) to abdominal circumference (AC) (3). Theoretically, early 'insults', such as chromosomal anomalies, infection, chemical exposures resulted in fewer cell numbers and thus a uniformly growth restricted fetus (3). Further, it was postulated that maternal, environmental, and placental factors that had greater significance in later pregnancy, such as hypertensive disorders in pregnancy, interfered with utero-placental interface and gave rise to an asymmetrical form of IUGR with normal head growth but restricted abdominal growth (3). The asymmetrically grown fetus was considered to be more severely compromised at greater risk for adverse outcomes (3)(11).

While adverse outcomes have been found to be higher in asymmetrically grown fetuses (12), ratios of biometry have not been found to be of diagnostic value in IUGR (2). Nicolaides et al (1991, as cited in (3)) found that fetuses with aneuploidy demonstrated asymmetrical growth restriction, while Salafia et al (1995, as cited in (3)) found that placental insufficiency secondary to hypertensive disorders resulted in a symmetrically growth impaired fetus. Simply put, brain sparing cannot be used to identify the underlying pathology of IUGR (13).

Complications (11)(14)(3)(5)(2)(15)

FETAL

- Fetal demise and stillbirth
- Non reassuring fetal monitoring
- Low APGAR scores
- Low umbilical cord pH

NEONATAL

- Preterm birth and accompanying complications
- Mortality
- Birth asphyxia
- Hypoxic-ischemic encephalopathy (HIE)
- Perinatal stroke and seizures
- Neurodevelopmental delay
- Meconium aspiration syndrome (MAS)
- Hypoglycemia
- Hypothermia

LONG TERM IMPLICATIONS FOR ADULTS

- Increased risk hypertension (HTN)
- Increased risk ischemic heart disease
- Increased risk non-insulin dependent diabetes mellitus (NIDDM)

Risk factors (11)(14)(15)(3)(9)(16)

EXTRINSIC/EXTERNAL

- Teratogenic & toxic exposures
- Maternal nutrition: controversial
- Low socio-economic status
- Living in a developing country

MATERNAL

- Low pre-pregnancy weight <100 lbs

- Suboptimal spacing of pregnancies <18-24 months from delivery to conception
- Maternal morbidity:
  - Chronic or pregnancy-induced hypertension
  - Chronic or pregnancy induced hypertension (PIH)-associated renal dysfunction
  - Advanced stage (insulin dependent diabetes mellitus (IDDM)
  - Asthma
  - Oral disease & dental carries
  - Cyanotic heart disease
  - Sickle cell anemia & inherited anemias
  - Autoimmune disorders (Antiphospholipid antibody syndrome, lupus)
  - Inflammatory bowel disease
- Infection: TORCH, Syphilis, TB, Hepatitis, Malaria, Listeriosis
- Smoking, alcohol, and illicit drug use
- High altitude

PLACENTAL

- Uterine anomalies impacting placental implantation
- Placental abruption
- Placenta previa
- Abnormal cord insertion
- Utero-placental insufficiency secondary to maternal morbidity

FETAL

- Aneuploidy:
  - Trisomy 21 (mild IUGR)
  - Trisomy 18 (significant IUGR)
  - Trisomy 13 (mild IUGR)
  - Other aneuploidies
- Congenital malformation:
  - Serious cardiac malformation
  - Osteogenesis imperfecta
  - Omphalocele
  - Diaphragmatic hernia
  - Skeletal dysplasia
- Viral, bacterial, protozoan, or spirochetecal infection
- Multiple fetuses

Guideline for Screening and Diagnosis

Identification of the growth restricted fetus improves with accurate dating, sensitive maternal and caregiver observation and communication, and proper use of screening methods.

Screening for IUGR is the role of the midwife. Screening methods for IUGR are incorporated and routinely employed in the practice of competent midwifery care.

SCREENING

- **Complete a thorough maternal health history.** At the initiation of midwifery care conduct a thorough medical, obstetrical, familial and social history with careful examination and discussion of any risk factors for IUGR (2)(3)(17); update this health history as necessary during the course of follow up care.
- **Offer smoking cessation information and supports.** Research demonstrated that neonatal weight is increased with smoking cessation during pregnancy (5)(15).
- **Establish an accurate EDB** as early as possible in prenatal care by taking a thorough menstrual history. If the gestational age cannot be determined with certainty from the LMP, an 8-12 week dating scan will establishing dates and following appropriate fetal growth (11)(18). Once established in the first trimester, an EDB should not be changed.

- **IPPS and MSS.** Offer all women prenatal genetic screening appropriate to the maternal age at time of delivery. Serum genetic screening can detect women at high risk of having an IUGR fetus by the determination of multiples of the median (MoM) of PAPP-A, HCG, and AFP (5).
- **Abdominal palpation.** Abdominal palpation is a poor screening method for fetal growth restriction; palpation detects as few as 30% of growth restricted fetuses (17).
- **Routine fundal height assessment.** Symphysis fundal height measurements have poor diagnostic accuracy with a sensitivity of 27% and a specificity of 88%; however serial measurements improve this accuracy (5). Abnormal fundal height measurements > 2-3 cm from EGA warrant ultrasonic biometrical investigation (11)(5)(3). Fundal heights can be charted on the graph provided on the Antepartum Record Part 2 to assist in following growth patterns; however, the use of customized fetal growth charts improves the sensitivity of this screening test with a reduction in unnecessary investigations for fetal growth (5).
- **Ultrasound examination as adjunct to screening.** Studies have shown that routine ultrasound assessment of fetal size in late pregnancy results in a greater number of interventions without evidence of benefit to the baby. However, with heightened clinical suspicion of IUGR, serial ultrasonic biometry at 2 week intervals assesses fetal growth velocity, which is of far greater significance than static fetal biometry (3)(5). The important biometrical markers are either the AC or the EFW; ratios of HC:AC are not considered a diagnostic for IUGR (5)(3). An AC within the normal range reliably excludes IUGR with a false positive rate of 10% (16). The use of customized fetal growth charts for biometrical evaluation reduces false positive IUGR(16)**Error! Reference source not found.**.
- **Amniotic fluid volume** is not considered of value in screening for IUGR (19)(5).
- **Uterine artery notching.** As an ultrasonic adjunct to abnormal MoM of PAPP-A, HCG, or AFP, with chronic maternal illness, or in the case of past obstetrical history, umbilical artery notching persisting beyond 24 weeks (after the second invasion of the placental trophoblast into the uterine spiral arteries) is significantly associated with increased risk of IUGR (2)(10).

Once abnormal screening results in a high suspicion of the growth restricted fetus, further diagnosis, surveillance and management is the expertise of the consultant. However, it is imperative in order to provide shared care or supportive care in the case of care transfer, midwives must be familiar with the methods of diagnosis and potential management options supported by the literature.

DIAGNOSIS

- **Biometrically decelerated growth rate.** Declining fetal growth through biometrical ultrasonic evaluations, in particular, with an AC <2.5-3% (2); decelerated fetal growth is an important marker; however fetal growth rate alone leads to a high false positive rate (5).
- If a fetus is truly IUGR, rather than constitutionally small, as fetal adaptive measures in response to stress fail to accommodate further fetal well being, decompensation results and pathological signs appear.
- Whereas the tendency is to diagnose IUGR based on two or more consecutive ultrasonic biometrical evaluations, integration of several testing modalities gives a more accurate diagnosis of IUGR and assists in the determination of appropriate management strategies (2)(5)(10).
- However, during ultrasonic evaluation it is imperative to perform a detailed ultrasound including examination for soft markers of aneuploidy (such as nuchal thickening, echogenic bowel) (2)(5)(20) as up to 19% of fetuses who have an AC or EFW <5%ile may have chromosomal defects (5). It is also imperative to scan for congenital malformations, markers of fetal viral infections, and hydrops (2).
- Amniotic fluid volume is has poor prognostic value (16)(19) yet, large volumes of AF are associated with aneuploidies and fetal viral infection and low levels may be associated with poor placental function (2).

These findings have a direct relationship to correct management strategies

- **Doppler ultrasound of the umbilical artery.** Ultrasonic biometry identifies the fetus that is small but biophysical assessments such as Doppler identify the fetus that has impaired well being (5). Umbilical artery Doppler is the primary surveillance tool in an IUGR fetus (5)(2) and should be performed on initial clinical evaluation and on all follow up evaluations (10).
- **Middle cerebral artery Doppler.** Adding a MCA Doppler provides a more complete assessment (2).

"When an anomaly scan and umbilical artery Doppler are normal, the small fetus is likely to be a normal small fetus" (5).

Management Guidelines

DISCUSSION

- Discussion with another midwife or with a physician is indicated by the (21) with the following risk factors for IUGR:
    - For adverse socio-economic conditions
    - Cigarette smoking
    - History of one low-birth-weight infant
    - Less than 12 months from delivery to present due date
    - Poor nutrition
    - History of essential or pregnancy-induced hypertension
    - Known uterine malformations or fibroids

CONSULTATION

- Consultation with a physician is indicated by the CMBC (21):
    - In instances where a medical history indicates strong risk factors for IUGR, including:
        - Current medical conditions
        - History of more than one low-birth-weight infant
        - History of ecclampsia
        - Rubella during first trimester of pregnancy
        - Significant use of drugs, alcohol, or other toxic substances
    - For inappropriate uterine growth
    - When medical conditions arise during pregnancy
    - Pregnancy induced hypertension
    - Abnormal PAPP-A, APF, or HGC MoM from serum genetic screening, referral to EMMA clinic or perinatology should be offered, discussed, and appropriately documented

TRANSFER OF CARE

- Transfer of care may be the outcome of antenatal consultation with an obstetrician depending upon the diagnosis and clinical presentation of IUGR and the best management plan and outcome of informed choice discussions between a woman, her midwife, and the consultant (21). However, transfer is the appropriate midwifery management in the following cases related to IUGR:
    - Serious medical conditions such as cardiac or renal disease with failure, IDDM
    - Multiple pregnancy (other than twins)
    - Protienuric pre-ecclampsia or ecclampsia
    - Severe hypertension

DIAGNOSIS

- Diagnosis occurs through consultation with an obstetrician, as outlined above.

SURVEILLANCE

- **Daily movement counting** (10)(2)(11). Women who are at a higher risk of IUGR should be instructed to perform daily fetal movement counting starting at 26-32 weeks gestation (10).
- **Increasing intervals of fetal surveillance.** Based on the findings of initial surveillance, rates and methods of fetal surveillance may increase or expand to include ultrasound biometry for growth velocity, umbilical artery Doppler, umbilical venous, and MCA Doppler studies (10)(5).
- **Addition of the biophysical profile (BPP).** The BPP is not a recommended primary surveillance technique for the growth restricted fetus (5). However, if umbilical artery Doppler is abnormal, BPP may be useful to assist in the timing of delivery (2)(3)(5).
- **Well-timed iatrogenic delivery.** Consideration of gestational age and measures of fetal lung maturity should be taken into account in the timing of delivery; if preterm, the increased surveillance can be implemented to

monitor and support the fetus until term or until the risks associated with the IUGR outweigh those of a premature birth (2)(3)(5).

- **Administration of antenatal steroids to enhance fetal lung maturity.** There is a high level of evidence to support the administration of antenatal steroids for fetal lung maturity up to 36 weeks gestation in cases of IUGR (5).

Guideline for Intrapartum care with clients diagnosed with IUGR

- It is recommended that delivery occur in a unit with optimal neonatal expertise and facilities (5); this has implications for an informed choice discussion on place of birth (22).
- Continuous intrapartum electronic fetal monitoring is recommended by the CMBC and SOGC for growth restricted fetuses (10)(23).
- Given a higher rate of respiratory depression in an IUGR fetus, pediatric staff skilled in clearing the airway below the vocal cords and in ventilating a depressed newborn should be present (5).
- Neonataology staff should be present in those fetuses remote from term or in whom fetal growth restriction is severe (5).
- In cases where an IUGR / SGA fetus is not expected from antenatal screening, a neonate weighs <2500 grams at time of delivery, the midwife should consult with a pediatrician (21).

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