

Neonatal management of the IUGR baby



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What is IUGR?

Numerous synonyms in the past

- Intrauterine growth retardation
- Small for gestational age
- Small for dates
- Light for dates
- Chronic fetal distress
- Hypotrophic fetus
- Intrauterine growth stunting
- Intrauterine malnutrition
- Dysmaturity
- Clifford syndrome
- Postdates / Postmaturity
- Failure to thrive in utero
- Fetal deprivation syndrome
- Pseudoprematurity



Two acceptable terms: Closely related but not synonymous

- **Intrauterine growth restriction (IUGR):**
 - failure of the fetus to achieve its growth potential for a given gestational age
- **Small for gestational age (SGA):**
 - having a birth weight below the 10th percentile for a given gestational age

Definition of "normal size"

- Various growth standards:
 - Ultrasound estimated fetal weight standards → algorithms based on AC, BPD, FL
 - Intrauterine growth curves based on birth weight
 - Customized fetal growth charts
- Various cut-off points:
 - Less than 10th, 5th, 3rd centile
 - Less than 2 SD below the mean



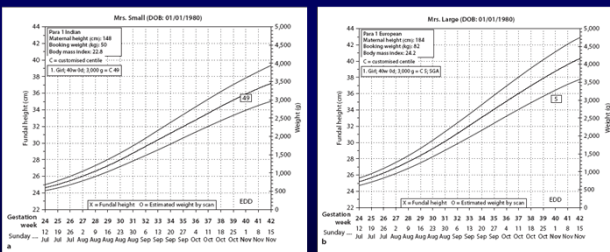
Estimated fetal weights versus birth weights: should the reference intrauterine growth curves based on birth weights be retired?

Richard A Ehrenkrantz
Arch. Dis Child. Fetal Neonatal Ed. 2007;92:F161-F162
doi:10.1136/adc.2006.109439

- Intrauterine growth curves based on EFW may be more representative of normal fetal growth
- HOWEVER:**
- The accuracy of measurements included in the computation of EFW ?
 - The accuracy of the knowledge of the duration of pregnancy ?
- THEREFORE:**
- Don't forget about "hidden" IUGR infants, but continue to use reference growth curves based upon BW in clinical practice

Customized growth charts

Adjustment of the expected BW by its determinants:
gest. age, sex, parity, maternal wt & height, ethnicity



Gestation Related Optimal Weight software version 7.5.1 (www.gestation.net)

Fetal Diagnosis Therapy

Fetal Diagn Ther 2009;25:297-303
DOI: 10.1159/000255875

Received: June 5, 2009
Accepted: June 9, 2009
Published online: September 22, 2009

Should We Customize Fetal Growth Standards?

F. Figueras^{a,b}, J. Gardosi^c

Good quality of evidence to recommend the use of customized BW standards:

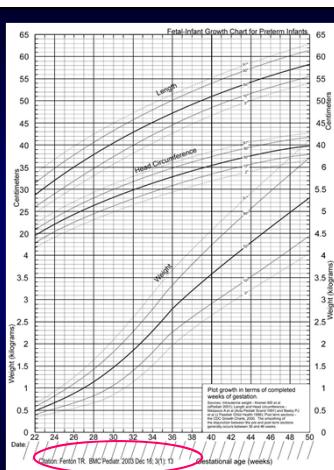
- better prediction of neonatal morbidity and mortality
- improved distinction between constitutional and pathological smallness

Rational management plan

- Define the baby as symmetrical or asymmetrical SGA
- Obtain a complete maternal and pregnancy history to address the etiology
- Distinguish constitutional smallness from pathologic growth restriction
- Anticipate potential neonatal problems
- Design early neonatal management:
 - delivery room, care assignment, monitoring

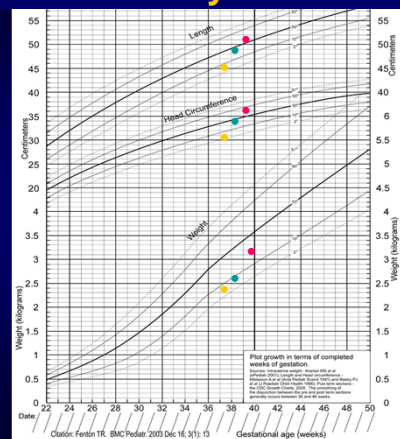
Reliable gestational age

- USG dating in early gestation
- If the obstetric dates are not certain, GA assessment : *Ballard scoring*
- However physical examination findings may be misleading:
 - more mature appearing skin
 - less mature appearing ear cartilage, breast tissue and female genitalia
- Neurologic examination is less affected



- Intrauterine growth charts developed after 1990's are more appropriate
- **Fenton, 2003:**
- Fetal-infant growth chart developed through meta-analysis of published reference studies
- Literature search 1980-2002
- For intrauterine data:
 - Kramer, et al. Canada, 2001
 - Niklasson, et al. Sweden, 1991
 - Beeby, et al. Australia, 1996
- For postnatal data:
 - CDC growth data, USA 1963-1994

Symmetrical & asymmetrical IUGR



- sSGA
- aSGA
- aIUGR

$$PI = Wt/L^3$$

↓ in aSGA

Neonatologist's dilemma in SIUGR: To screen or not?

- Prenatal history and neonatal physical examination are the most important tools
- In the absence of a defining obstetric history or abnormal physical findings it is unlikely that screening neonatal lab tests will identify the cause
- The possibility of unrecognized or clinically silent TORCH infections or undiagnosed genetic causes is small

Consultation with the Specialist: Prenatal Growth: The Sum of Maternal, Placental, and Fetal Contributions
David G. Oelberg
Pediatr. Res. 70:06-27-724-776

Potential neonatal problems

- PERINATAL ASPHYXIA
- Hypoglycemia
- Polycythemia
- Hypothermia
- Meconium aspiration syndrome
- Persistent pulmonary hypertension
- Coagulation disorders, pulmonary hemorrhage
- Necrotizing enterocolitis
- Immune dysfunction


Hypothermia

- ↑ head volume & body surface area
- ↓ subcutaneous fat
- ↓ fat stores
- ↑ hypoxia & hypoglycemia interfere with heat production
- Prompt & complete drying
- Warm linen, warm hat
- Radiant heater
- Polyethylene bag
- Kangaroo care



Hypoglycemia

- Highest in the first 3 days of life, may persist longer
- May be asymptomatic or symptomatic:
 - General (abnormal cry, poor feeding, hypothermia), Neurologic (tremors, jitteriness, hypotonia, irritability, lethargy, seizures), Cardiorespiratory (cyanosis, pallor, tachypnea, apnea, cardiac arrest)
- The etiology includes:
 - ↓ hepatic glycogen stores
 - ↓ alternate energy substrates
 - impaired gluconeogenesis
 - hyperinsulinemia / ↑ sensitivity to insulin / both
 - deficient counter-regulatory hormones



**Critical question:
How much low is “too low”?**

A consistent definition of hypoglycemia does not exist in the literature !

“In the absence of a definitive blood glucose concentration below which permanent brain injury occurs with certainty, **45-47 mg/dL (2.5-2.6 mmol/L) is a reasonable lower limit target value** for maintaining circulating plasma glucose concentration once therapy has been initiated”

Hypoglycemia in Newborn Infants: Features Associated with Adverse Outcomes
Biol Neonate 2006;90:74-86
DOI: 10.1159/000091948
Paul J. Rozance, William W. Hay



Management of hypoglycemia

- **BG < 47 mg/dL & symptomatic:**
 - give an i.v glucose bolus of 200 mg/kg (2mL/kg of 10% dextrose)
 - followed by a continuous i.v infusion at 6-8 mg/kg/min.
- **BG < 47 mg/dL but asymptomatic:**
 - give an oral feed and check BG in 30 min
 - if still low start an i.v glucose infusion at 6-8 mg/kg/min
- **Continue frequent monitoring until:**
 - two consecutive measurements are normal
 - i.v glucose infusion has been tapered and stopped
 - the baby is on full enteral feeds

A paradox

- Breastfeeding should be started **as soon as** clinically appropriate
- Because of the risk of NEC in IUGR infants, enteral feeds should be advanced **cautiously**

Necrotizing enterocolitis

- Increased incidence of NEC in IUGR infants
- Increased risk in fetal absence 
OR 
reversal of end diastolic flow
- Persistent abnormalities in SMA blood flow postnatally
- Slow recovery in baseline values during the first week of life

Dorling J, et al. Arch Dis Child Fetal Neonatal Ed 2005;90:F259-63

Feeding IUGR baby: How soon? How cautiously?

- No large enough RCT to answer
- Delayed feeds could be detrimental
- Evidence for feeding strategy is limited
- It may be prudent to:
 - Delay enteral feeds at least 24 hrs
 - Feed with breast milk
 - Start with minimal enteral feeding for the first 48-72 hrs
 - Advance feed volumes gradually

Feeding growth restricted preterm infants with abnormal antenatal Doppler results
J Dorling, S Kempey and A Leaf
Arch Dis Child Fetal Neonatal Ed 2005;90:F309-313

Polycythemia-Hyperviscosity

- Central venous Hct $\geq 65\%$
- More common in aIUGR >34 wks gestation
- Leads to impaired end-organ perfusion:
 - Neurologic, cardiorespiratory, gastrointestinal (NEC), metabolic, thrombotic complications (RVT)
- Current neonatal practice:
 - partial exchange transfusion if central vHct is:
 - $\geq 65\%$ in symptomatic infants
 - $\geq 70\%$ in asymptomatic infants

To treat or not to treat ?

- Infants with severe neurologic symptoms may benefit
- No evidence of long-term neurologic improvement
- Poorer outcome in polycythemic infants is probably related to underlying cause
- Increased risk of NEC

ADC ONLINE Short and long term outcomes following partial exchange transfusion in the polycythaemic newborn: a systematic review
E M Dempsey and K Barrington
Arch Dis Child Fetal Neonatal Ed 2006;91:F2-F6; originally published online 20 Sep 2005

Coagulation disorders

- Chronic fetal hypoxia with hepatic underperfusion → disordered coagulation
- Worsened if asphyxia, hypothermia and hypoglycemia is present
- **Raised nucleated RBC** associated with severe cerebral & pulmonary hemorrhages
- Monitor PT , aPTT

IUGR reduces the risk of RDS in preterm babies: Myth or reality?

- Previous concept of IUGR associated with ↑ pulmonary maturation & ↓ incidence of RDS: **NOT supported** by recent studies
- The incidence of RDS ↑ with ↓ BW centile:
 - Reduced/Impaired release of surfactant
 - Diminished response to corticosteroids
 - Structural developmental abnormalities
- Benefits of antenatal corticosteroid treatment ?

-Regev RH, et al. Prematurity and IUGR- double jeopardy? Clin Perinatol 2004;31:453-73
-Torrance HL, et al. Is antenatal steroid treatment effective in preterm IUGR fetuses?
Acta Obstet Gynecol Scand 2009;Aug; 1-8

Increased risk of sepsis

- Compromised humoral & cellular immunocompetence:
 - ↓IgG
 - ↓Phagocytic index
 - ↓Lysosomes
- Neutropenia (infants of pre-eclamptic mothers)
- Neutrophil counts may be normal initially
- Repeat CBC
- Use of granulocyte Tx / GCSF ???

Indications for admission to a special or intensive care unit:

- Requirement of resuscitation
- Development of respiratory distress
- Polycythemia
- Hypoglycemia
- Severe growth restriction (< 3rd p)
- BW <1800g / GA <34 wks

Management plan

- Body temperature At birth, at 2 hrs, then every 6-8 hrs for 48-72 hrs
- Blood glucose At 30 min, 1, 2 and 4 hrs after birth, before feeds, any time if Sx (+)
- Hct / CBC At 4-6 hrs, repeat if needed: thrombocytopenia, neutropenia
- Bilirubin Based on clinical jaundice
- PT, aPTT
- Assign the baby to one of three levels of care
- Continue monitoring for possible clinical problems:
 - RDS, NEC, Sepsis

Research agenda

- **Estimated fetal weight vs birth weight vs customization:** Which one is more predictive of neonatal mortality and morbidity ?
- Is there a **viability centile** for extremely IUGR infants?
- How should **hypoglycemia and polycythemia** defined and when is treatment indicated?
- Which neonatal strategies can to reduce the increased risk of **sepsis and NEC** ?



Waiting for the answers for a better outcome...