Small babies- can we improve outcomes?

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Outline of Talk

- Why does small for gestational age (SGA) matter?
- How do we define SGA?
- Can we increase detection - how to use GROW.
- Effects of smoking
Why Does SGA Matter?
Consequences of SGA

Perinatal period
- Pregnancy
- Preterm birth
- Asphyxia
- Stillbirth

Neonatal Period
- Asphyxia
- Hypoglycaemia
- Polycythaemia
- Death

Childhood
- CP
- Lower IQ
- Short stature
- ↑ BP

Adulthood
- Hypertension
- Heart disease
- NIDDM
- CVA

Mother
- ↑ Ischaemic Heart Disease
Why Does SGA Matter? Consequences of SGA

- 40%- 50% of stillbirths SGA
- only 20-40% SGA babies detected antenatally!!
  - 30% in SCOPE
- improved antenatal detection with timely delivery may ↓ perinatal morbidity & mortality
Definitions/Assessment of size at birth

- IUGR/FGR = failure to reach growth potential
- SGA = birthweight <10\%ile using sex adjusted population charts
- Misses some growth restricted babies

- SGA includes babies that are “constitutionally small” and not growth restricted (20-30%)
SGA and IUGR
IUGR not SGA
Pathophysiology of SGA

“Placental Insufficiency”
60%
Reduced uteroplacental perfusion
(abnormal uterine Doppler)
Abnormal placental villi and vessels
(abnormal umbilical Doppler)
Abnormal Placental Transfer

Cigarettes
Alcohol
Drugs

Intrinsic Fetal
5-10%
Trisomies
Congenital infection
Anomalies

Constitutionally Small
20-30%
Small mother
Racial groups

Pathophysiology of SGA
Pregnant women – many sizes & ethnicities
Ethnicity

Mean birthweight: New Zealand 2000

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Mean Birthweight (kg)</th>
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<tbody>
<tr>
<td>European</td>
<td>3.43</td>
</tr>
<tr>
<td>Pacific</td>
<td>3.54</td>
</tr>
<tr>
<td>Asian</td>
<td>3.24</td>
</tr>
<tr>
<td>Maori</td>
<td>3.32</td>
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</tbody>
</table>

Risk of SGA by population birthweight centiles

- Asian (Indian): RR 4.4 (95% CI 2.9 - 6.6)
- Pacific Island: RR 0.7 (95% CI 0.55 - 0.95)

*Thompson J. Paediatr Child Health 2001*
Customised Birthweight Centiles

- Adjust for maternal variables:
  height, booking weight, parity, ethnicity,
  infant sex, gestation

Free download from www.gestation.net
Customised birthweight centiles

- Expected birthweight for a nulliparous European, height 165 cm, weight 70 kg delivered at 40 wks = 3530 gm

- Mean BWT for standard Caucasian woman same in UK, NZ, USA and Oz.

  **< European**
  - Maori – 67 g
  - Indian –150 g

  **> European**
  - Tongan +124 g
  - Samoan +84 g
  - Chinese +101 g
Same ethnicity - different sizes

Small Caucasian
wgt 50kg, ht 155cm
baby centile = 39

not SGA

Big Caucasian
wgt 98kg
ht 180cm
baby centile = 7

SGA

3200 g 40 wks
20th Population centile
SGA Customised vs SGA Population

- SGA customised + population: 70%
- SGA cust only: 20-30%
- SGA pop only: 20-30%

Identify cust SGA babies in big women
Reclassify as normal small healthy babies
Customised Birthweight Centiles

Adjust for maternal variables
- height, booking weight, parity, ethnicity,

Customised SGA associated with:
- abnormal umbilical and uterine Doppler
- preeclampsia
- early birth & neonatal unit admission
- stillbirth and neonatal death

Customised SGA better identifies
- placental insufficiency
- true growth restriction
Can we Increase Antenatal Detection of SGA babies?

- **ONLY** 20-40% SGA babies detected antenatally (30% in SCOPE)

- > 40% stillborn babies are SGA

- Better antenatal detection might ↓ morbidity and mortality
Contribution of SGA to perinatal deaths

SGA = Birthweight <10th customised Centile

Deaths >24 weeks excluding major abnormalities

- 44 % stillbirths & 28 % neonatal deaths SGA
  - 23% of these SGA babies detected before birth
    (PMMRC 3rd report November 2009)
- 44 % stillbirths SGA - West Midlands UK,
  (ReCoDe Gardosi BMJ 2005)
- UK review SGA stillbirths > 30wks
  - 22 % detected before birth
  - many had avoidable factors
Customised antenatal growth charts- GROW

- Developed by Gardosi et al (www.gestation.net)

- Produce computer generated curves for optimal fetal weight and fundal height adjusted to characteristics of each pregnancy.

- Contain data from Australian and NZ births

- Doubled antenatal detection of SGA in controlled trial

Gardosi and Francis BJOG 1999, 106:309-17
## RCT of GROW vs Routine Care

<table>
<thead>
<tr>
<th></th>
<th>Study group n=667</th>
<th>Control n=605</th>
<th>OR(95%CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>66.2</td>
<td>65.5</td>
<td></td>
<td></td>
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<tr>
<td>SGA detected</td>
<td>48%</td>
<td>29%</td>
<td>2.2 (1.1-4.4)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>&gt;2 growth scans</td>
<td>16%</td>
<td>20%</td>
<td>0.8 (0.6-1)</td>
<td></td>
</tr>
<tr>
<td>Antenatal admissions</td>
<td>0.23</td>
<td>0.39</td>
<td></td>
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Routine use recommended by RCOG - should be generated for all women at booking visit.
Antenatal GROW Chart - no need for scan

Small Indian woman
BMI - 24
previously AGA
36w SFH 33cm
Normal increase in SFH
Growth scan not required
Antenatal GROW chart - needs scan

Large European
BMI - 29

previous SGA

35w SFH 33cm

Suboptimal increase in SFH

Growth scan required

Stillbirth, 39 wks

2780 g, 2nd %
SGA stillbirth - no growth chart

Stillbirth 41 wks 2340g
Current Pregnancy
- 35 year old, P2 G3, previous babies >4kg born by LSCS
- booked 16 wks
- BMI 48
- Normal GTT
- 3 growth scans, no GROW chart
- growth thought to be in normal range but smaller than previous babies
- LSCS 39+ wks (2 previous LSCS)
- no fetal heart on admission
- male baby, birthweight 2810g, 2%ile
Ultrasound growth chart
Customised growth chart produced after death

GROW Chart generated after stillbirth

Para 2  Samoan
Maternal height (cm): 170
Booking weight (kg): 140
Body Mass Index: 48.4 High

C = customised centile

1. female; 40w 0d; 4100g = C 83
2. boy; 40w 0d; 4400g = C 88

Weight (g)

X = Fundal height  O = Estimated weight by scan

Date of visit
BP: Systolic
Customised Growth Charts in Obese Women

- Can’t use fundal height component of GROW
- Growth scans- limitations but best tool to estimate fetal size
- Plot EFW on GROW & fetal measurements on ultrasound growth chart
- GROW likely to better estimate optimum fetal weight than population scan charts
Customised growth charts- summary

- Measure height and booking weight in all !!
- Generate a GROW chart at booking
  - calculates BMI
  - generates BWT centile for previous babies
- Likely to reduce scans in small women
- Likely to ↑ detection of SGA
- No evidence based interventions for big baby
- Risk factors for SGA- serial scans!

www.gestation.net
Growth scans- when to perform?

85% SGA babies in nulliparous women born at term!!

Groom, North, Poppe, Sadler, McCowan BJOG 2007,114:478-84
Don’t perform in low risk women

Routine early 3\textsuperscript{rd} trimester scan does not
\(\downarrow\) perinatal morbidity / mortality

High Risk of SGA

- plan serial growth scans
- >80 % SGA babies (in nullips) born at term
  - Scan early in 3\textsuperscript{rd} trimester may miss SGA
  - Continue scans until term
- Need scans as well as GROW

Plot measurements on customised growth chart
as well as ultrasound measurement chart
Risk of SGA Stillbirths by gestation


- Stillbirth risk for SGA fetus 4x the AGA fetus
- Risk for SGA fetus increases after 37 wks- absolute risk small
Other Recommendations to increase detection of SGA

- Major risk factors e.g. previous SGA, renal disease - specialist referral, low dose aspirin, serial growth scans
- Frequency & gestation of 1st scan depends on risk
- Scan late in 3rd trimester
- Major Increases in detection of SGA depends on development of reliable screening tests
- This may become a reality in the next decade
Smoking in Pregnancy - Fetal Tobacco Syndrome

- Infertility  \(\uparrow 25\%\)
- Miscarriage  \(\uparrow 25\%\)
- Ectopic  \(\uparrow 90\%\)
- Cleft lip  \(\uparrow 35\%\)
- Abruption and placenta praevia  \(\uparrow 60\%\)
- Preterm labour and PPROM  \(\uparrow 70\%\)
- SGA  \(\uparrow 100\text{-}200\%\)
- Stillbirth  \(\uparrow 100\%\)
- Preeclampsia  \(\downarrow 30\%\)

SMOKER-HIGH RISK PREGNANCY!!

Smoking in Pregnancy - Fetal Tobacco Syndrome
Smoking and Pregnancy Outcomes

- Dose dependent effects
- Risks in a future pregnancy reversed by stopping smoking
- Principles apply to most pregnancy problems

Smoking the single most avoidable risk factor for adverse pregnancy outcome!!
Women who cease smoking by 15 weeks had rates of SGA and preterm birth not different to non smokers.

Those who continued to smoke:
- 3 fold ↑ PTB
- 2 fold ↑ SGA

Spontaneous preterm birth and small for gestational age infants in women who stop smoking early in pregnancy: prospective cohort study

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Conclusions

- This suggests the adverse effects of smoking on SPTB and SGA may be preventable if smoking is ceased early in pregnancy
- These data have considerable public health implications
- Maternity care providers should strive to assist pregnant smokers to become smoke-free early in pregnancy, by 15 weeks’
  - Early pregnancy booking essential
  - Smoking history
  - Referral for support
Continued Smokers

Comprise 10-45% of pregnant women

- 2 fold ↑ SGA
- Most SGA babies born at term
- Limited scanning resources in many centres
- Consider scan at 38 weeks especially if any other risk factors
- Term & post-term SGA fetus vulnerable and needs to be detected