SIXTH INTERNATIONAL CONFERENCE ON FETAL GROWTH

20-22 September 2017
Fota Island Resort
Cork, Ireland

www.fetalgrowth.org

Programme and Abstracts

Contents Page

Scientific Programme

Key to abstract numbering
Session number (1-12); order within session (1-x); type of presentation (K/O/PO)

Times allocated for presentations

K	Keynote	15 minutes, 5 minutes for questions / discussion
O	Oral	8 minutes, 2 minutes for questions / discussion
PO	Poster Oral	2 minutes, 1 minute for questions / discussion

E-posters (P and PO) will be on display on dedicated screens throughout the meeting.

Social Programme
(entrance by ticket only)

Wednesday 20 September
Welcome reception – Fota Golf Club
6:00 pm Historical Lecture - Niblicks Function Room
From 6:30 pm: Drinks and Barbecue - Lakeside Terrace
Dress: informal

Thursday 21 September
Gala Dinner & Dance - Fota Ballroom
7:30 for 8pm; Dress: smart-casual

GENERAL INFORMATION

Address: Fota Island Resort, Fota Island, Cork, Ireland Tel: +353 21 488 3700

Admission to the conference is with name tag only
In the interest of security please make sure that your name tag is visible at all times.

Wifi - free access throughout the hotel & conference centre (no password required).

Welcome!

Dear Participant,

We would like to extend a warm welcome to the Sixth International Conference on Fetal Growth.

Since its inception in 2012, this conference has grown year on year, which confirms an increasing awareness of the importance of fetal growth, its central role in maternal and perinatal care, and the need for a dedicated meeting to track developments in this field.

This year, we are pleased to be in Cork, on invitation of the National Perinatal Epidemiology Centre of Ireland, who co-host this year's meeting with the Perinatal Institute. Once again, we have benefited from a supportive international scientific committee and a faculty of lead researchers in the field. We have been able to accept a record number of submitted abstracts (80) and are pleased to be welcoming over 200 delegates from 25 countries. The presentations are again balanced by protected time for plenary & open forum discussions, and we would like to encourage your active participation.

Importantly, this participation should also extend to the social programme! In particular the Gala Dinner and Dance, which will allow us to sample the best of Irish music and dance.

We hope you enjoy FG17!

Richard Greene
Professor and Director,
National Perinatal Epidemiology Centre,
Cork, Ireland

Jason Gardosi
Professor and Director,
Perinatal Institute,
Birmingham, UK

Francesc Figueras
Professor of Maternal-Fetal Medicine,
University of Barcelona
Barcelona, Spain

Lesley McCowan
Professor of Obstetrics & Gynaecology,
University of Auckland,
Auckland, New Zealand

Ahmet Baschat
Professor of Gynecology & Obstetrics
Johns Hopkins University,
Baltimore, USA

Wednesday 20 September

Workshop 1: Growth Assessment Protocol (GAP)

From 09:00	Registration
09:30	Welcome and Introduction Fetal growth restriction and pregnancy outcome Customised charts: principles and clinical implications Risk assessment and surveillance: guidelines, algorithms
11:00	Coffee/Tea
11:30	Clinical Application Fundal height - standardised measurement and plotting Referral protocols – indications for further investigation Clinical and practical application – case studies Documentation and record keeping - plotting and referral scenarios
12:30	Lunch
13:30	Routine Data Collection Birth data: benefits and how to implement Baseline audit – rates of SGA, referral and detection prior to implementation of GAP Missed case audit tool – implementation, identifying issues and addressing problems
15:00	Coffee/Tea
15:30	The role of Ultrasound Protocols & algorithms Routine scans for all? – review of the evidence General discussion
17:00	Close

Faculty: Jason Gardosi, Professor and Director, Perinatal Institute, Birmingham, UK
Sally Buller, Senior Midwife, Perinatal Institute, Birmingham UK
Mandy Williams, Health Informatics Manager, Perinatal Institute, Birmingham UK

Workshop 2: Ultrasound and Doppler

From 09:00		Registration
09:30	NR	Ultrasound biometry
10:00	FF	Structural scans
10:30	JG	Audit and Quality Assurance
11:00		Coffee/Tea
11:30	FF	Live Demonstration
12:30		Lunch
13:30	FF	Doppler – Basics
13:45	FF	Doppler Investigation I (UA, ACM, CPR, UtA)
14:15	NR	Live Demonstration
15:00		Coffee/Tea
15:15	AB	Biophysical profile & amniotic fluid
15:45	AB	Doppler Investigation II (UV, DV)
16:15	AB/FF	Live Demonstration
17:00		Close

Faculty: Ahmet Baschat, Professor of Gynecology and Obstetrics, Johns Hopkins University, Baltimore, USA
Francesc Figueras, Associate Professor of Maternal-Fetal Medicine, University of Barcelona, Spain
Noirin Russell, Consultant Obstetrician and Gynaecologist; Clinical Senior Lecturer, Cork University Maternity Hospital

Welcome Reception - Fota Golf Club

18:00	Niblicks Function Room	Cork Harbour: Ships, Sailing and Seafarers - Dr Alicia St Ledger, Cork Historian
From 18:30	Lakeside Terrace	Drinks and Barbecue

Thursday 21 September

From 08:00	Coffee/Tea		**REGISTRATION**
Session no. & time	**Chairs, Co-chairs Speakers**	**Abstract Number**	**Title of session / presentation (K=Keynote; O=Oral; PO=Poster Oral)**
08:30	Jason Gardosi (JG) Richard Greene (RG)		Welcome and Introduction
Session 1	JG & RG		**FETAL GROWTH, PREMATURITY AND THE INFANT**
08:40	Gene Dempsey	1.1 K	Perinatal and long term outcomes
09:00	Jennifer Zeitlin	1.2 K	Prematurity and fetal growth restriction
09:20	Edurne Mazarico	1.3 O	Neurobehavior in IUGR infants with abnormal uterine artery Doppler
09:30	J Caradeux	1.4 O	SGA by non-customized vs. customized fetal standards in extreme preterm neonates: association to mortality and severe morbidity
09:40	H Bartels	1.5 O	Identifying fetal growth trajectories and their association with maternal and child characteristics: secondary analysis from the ROLO study
09:50	Plenary/Open Forum		
10:20	Coffee/Tea Break		
Session 2	Lesley McGowan & RG		**GROWTH STANDARDS AND CLINICAL IMPLICATIONS**
10:40	Katherine Grantz	2.1 K	The NICHD program on fetal growth
11:00	Jennifer Zeitlin	2.2 K	INTERGROWTH and standards in Europe
11:20	Torvid Kiserud	2.3 K	The WHO fetal growth standard
11:40	Jason Gardosi	2.5 K	Customised charts for global application
12:00	Birgit Arabin	2.6 O	Do German newborns follow the INTERGROWTH charts as postulated?
12:10	Alexander Heazell	2.7 O	Identification of placental insufficiency in a cohort of stillbirths – Evaluation of the performance of customised (GROW) and INTERGROWTH- 21 birthweight standards
12:20	Plenary/Open Forum		
12:50 - 13:30	Lunch		
Session 3 13:30	Katherine Grantz Birgit Arabin		**Poster-Oral 1** - see list, page 7
Session 4	Jennifer Zeitlin & JG		**RISK FACTORS, SCREENING AND SURVEILLANCE**
14:10	Lesley McCowan	4.1 K	Risk factors and prevention of FGR
14:30	R J Martinez-Portilla	4.2 O	Added value of maternal perceived stress as a predictor of small for gestational age
14:40	Isabelle Monier	4.3 O	Maternal vitamin D status in the first trimester of pregnancy and risks of having a small-for-gestational age or preterm birth: a prospective cohort study
14:50	Grainne Milne	4.4 O	The Introduction of "GAP" for the first time in the Republic of Ireland – the good, the bad and the ugly
15:00	Mandy Williams	4.5 O	Missed Case Audit of babies born small for gestational age
15:10	Plenary/Open Forum		
15:40	Coffee/Tea Break		
Session 5	Richard Greene Alyson Hunter		**FGR AND STILLBIRTH: CAUSES AND PREVENTION**
16:00	Paul Corcoran	5.1 K	Fetal growth restriction among stillbirths and its antenatal detection in Ireland: a national clinical audit
16:20	Alex Heazell	5.2 K	The NHS Care bundle for stillbirth prevention: the importance of fetal growth restriction
16:40	Andre Francis	5.3 O	Prevalence of 'disorders of fetal growth' according to the ICD-PM classification
16:50	Nuzhat Aziz	5.4 O	Customised centiles and reduction of stillbirth rate at a South Indian Perinatal Institute
17:00	Sally Buller	5.5 O	Reducing stillbirths in North England: the SaBiNE project
17:10	E Romano	5.6 O	Reducing stillbirth by fetal growth surveillance
17:20	Hannah Rickard	5.7 PO	Reducing stillbirth – implementing the 'Saving Babies' Lives' care bundle
17:23	Sucheta Jindal	5.8 PO	Understanding each still birth: a way forward to "Saving Babies Lives"
17:26	Plenary/Open Forum		
18:00	Close		
19:30 for 20:00			**GALA DINNER & DANCE**

Friday 22 September

08:00	Coffee/Tea		Registration
Session no. & time	**Chairs, Co-chairs Speakers**	**Abstract Number**	**Title of session / presentation (K=Keynote; O=Oral; PO=Poster Oral)**
Session 6	Tamas Marton & JG		**THE PLACENTA**
08:30	Brendan Fitzgerald	6.1 K	The placenta in early and late onset IUGR
08:50	Alex Heazell	6.2 O	Placental changes in diabetic stillbirths
09:00	Khadijah Ismail	6.3 PO	Placental and umbilical cord morphometry of pregnancies with SGA infants
09:03	Khadijah Ismail	6.4 PO	Abnormal placental cord insertion and adverse pregnancy outcome
09:06	Beata Hargitai	6.5 PO	Perinatal post-mortem without the baby: applying ReCoDe for placenta examination
09:09	Discussion		
Session 7	Francesc Figueras & RG		**EARLY ONSET IUGR**
09:20	Ahmet Baschat	7.1 K	Investigation and management
09:40	Rebecca Spencer	7.2 O	Maternal serum biomarkers for prediction of fetal & neonatal mortality in early onset FGR
09:50	F Mone	7.3 O	A randomized controlled trial and cost-effectiveness analysis of low dose aspirin
10:00	E Ingram	7.4 O	Longitudinal measures of placental DR1 and R2* in normal and FGR pregnancies
10:10	Plenary/Open Forum		
10:40	Coffee/Tea Break		
Session 8	Ahmet Baschat & JG		**LATE ONSET IUGR**
11:00	Francesc Figueras	8.1 K	Investigation and management
11:20	Ngaire Anderson	8.2 O	Low PIGF and ultrasound defined FGR in late-onset SGA pregnancies
11:30	Javier Caradeux	8.3 O	Longitudinal growth assessment for the prediction of adverse perinatal outcome among SGA-suspected fetuses
11:40	M Rial Crestelo	8.4 O	Added value of cerebro-placental ratio at routine third trimester screening
11:50	J Morales-Roselló	8.5 O	Birth weight differences at term are explained by the gender, gestational age, placental dysfunction, but not by ethnicity
12:00	Anne Ego	8.6 O	Preventing third-trimester SBs by improving detection of FGR: a population-based nested case-control study in France
12:10	Plenary/Open Forum		
Session 9 12:40	Brendan Fitzgerald Alexander Heazell		**Poster-Oral 2** - see list, page 7
13:10 - 13:50	Lunch		
Session 10 13:50	Torvid Kiserud Ed Johnston		**Poster-Oral 3** - see list, page 7
Session 11	Anne Ego & RG		**TWINS, MACROSOMIA**
14:30	Katherine Grantz	11.1 O	Fetal Growth in twins
14:40	Jason Gardosi	11.2 O	Twin growth and late onset IUGR
14:50	Discussion		
15:00	Francesc Figueras	11.3 O	Cross-sectional versus longitudinal assessment of abdominal circumference and EFW
15:10	K Cresswell	11.4 O	Predicted fetal macrosomia on scan - Intervention rates post Montgomery Ruling
15:20	Discussion		
15:30	Coffee/Tea Break		
Session 12	Richard Greene Jason Gardosi		**POLICIES & PROTOCOLS; NEXT STEPS**
15:50	Abstract winners		**Presentation of Best Abstracts**
16:30	Lesley McCowan	12.1 K	Overview of international status quo
16:50	Alyson Hunter	12.2 K	Protocols developed in 'Perinatal Ireland'
17:10	Plenary / Open Forum		
17:40	Closing Remarks		
17:45	**Close of conference**		

E- Posters (on display throughout the conference)

with short oral presentations (2 + 1 min. discussion)

Date & Time	Presenter		Title of abstract
Session 3 Thursday 21 Sept. 13:30-14:10	Baston H.	3.1 PO	Quilting to quit smoking in pregnancy: a feasibility study
	Grantz K.	3.2 PO	Can longitudinal fundal height predict small-for-gestational age with improved accuracy over cross-sectional measures?
	Kajdy A.	3.3 PO	Does detection of sga change neonatal outcome – retrospective cohort study
	Watson H.	3.4 PO	Establishing a midwife-led fetal growth assessment (MFGA) clinic for low risk women to detect fetal growth restriction
	Wuppalapati P.	3.5 PO	Audit for missed small for gestational age babies
	Dromey B.	3.6 PO	Customised growth charts – effects on outcomes in a large teaching hospital
	Dromey B.	3.7 PO	Customised growth charts in clinical practice - intrapartum & postnatal outcomes for monitored and unmonitored groups
	Hunter A.	3.8 PO	Improving birth outcomes: a prospective audit of the detection and management of small for gestational age (sga) fetuses
	Arabin B.	3.9 PO	Maternal impact on fetal birthweight and length from 2000-2015 within a German federal province (Hessen, 6 million inhabitants)
	Meler E.	3.10 PO	Customised birthweight standards for a Spanish population
	Araújo Pereira J.	3.11 PO	Is there any relationship between non- O blood type and pregnancy with fetal growth restriction?
	Gomes M.	3.12 PO	High blood viscosity: a risk factor for fetal growth restriction?
	Gomes M.	3.13 PO	Predictors of vaginal delivery among growth-restricted fetuses
Session 9 Friday 22 Sept 12:40-13:05	Lean S.C.	9.1 PO	A mouse model of advanced maternal age – understanding mothers' vulnerability to fetal growth restriction and late stillbirth
	Kajdy A.	9.2 PO	Fetal congenital heart disease and intrauterine growth restriction
	Ní Laighin C.	9.3 PO	Fetal growth restriction – does asymmetry matter?
	Muniesa M.	9.5 PO	Hypertensive disorders and fetal growth restriction in high risk of preterm birth pregnancies
	Eastwood K.A.	9.6 PO	The impact of small for gestational age birth for mothers and infants: analysis of outcomes from the predict study
	Mulcahy C.	9.8 PO	The impact of aspirin on 3D placental volumes and vascular flow indices in the first and second trimesters of pregnancy and correlation with uterine artery doppler: results of the test multicentre RCT
	Morales-Roselló J.	9.9 PO	Accuracy of the fetal cerebroplacental ratio for the detection of intrapartum compromise in non small fetuses
	Johnstone E.D.	9.10 PO	Serial ultrasound assessment from 28 weeks is unnecessary in babies at moderate risk of fetal growth restriction (FGR)
Session 10 Friday 22 Sept 13:45-14:20	Lubusky M.	10.1 PO	Combined screening for small for gestational age at 11–13 weeks
	Silvio M.	10.2 PO	Evaluation of depression, stress, social support and self-esteem in pregnant woman with suspected fetal growth restriction
	Dempsey A.	10.3 PO	Intra and inter-examiner variability in fractional thigh volumes (tvol) in pregnancies complicated by maternal pre-existing diabetes and obesity
	Thurlwell Z.	10.4 PO	Single fractional thigh volume image acquisition and analysis has improved reproducibility compared to the average of multiple images.
	Khatib S.	10.5 PO	The role of sonographers in supporting families pregnant after loss: a quality improvement project
	van de Kamp K.	10.6 PO	Validation of reference charts for mid-trimester fetal biometry
	Cahuana M.	10.7 PO	Maternal residential proximity to major roads and placental function
	Straface G.	10.8 PO	Aortic intima media thickness in fetuses of underweight and obese women
	Weiner-Gorzel K.	10.10 PO	An audit of macrosomia and maternal care for excessive fetal growth in cork university maternity hospital
	Bell L.	10.11 PO	Waist circumference, gestational diabetes and fetal birthweight in pregnant women with class iii and iv obesity
	Kosinska-Kaczynska K.	10.12 PO	Neonatal outcome in twin gestations complicated with selective or non-selective intrauterine growth restriction
	Marton T.	10.13 PO	The role of fetal growth restriction in term intrapartum, and neonatal death.

E- Posters (on display throughout the conference)

Presenter		Title of abstract
Almeida L. et al	1.1 P	Birth weight and cardiac remodelling according to maternal residential proximity to a major road
Ramamoorthy P. et al	1.2 P	Pattern of vitamin-D levels among pregnant women attending tertiary care hospital, Madurai
Myagerimath R. et al	1.3 P	Comparison of grow and who birth weight centile and its impact on our neonatal services
Molinet C. et al	1.4 P	Decreased birth weight in relation to maternal exposure to trihalomethanes (thm) in drinking water during pregnancy.
Mazanowska N. et al	1.5 P	Fetal growth restriction with polyhydramnios: still an ominous sign
Ghosh M. et al	1.6 P	Fetal growth restriction – is it a preventable risk factor for perinatal mortality
Brodrick A. et al	1.7 P	Innovative service improvement package to improve the care of women presenting with reduced fetal movements
Meneses T. et al	1.8 P	Emergency Cesarean birth in term pregnancy – possible association with undiagnosed late fetal growth restriction
Meneses T. et al	1.9 P	Gestational age and abnormal doppler evaluation at diagnosis of fetal growth restriction
Palma Reis C. et al	1.10 P	Indication and mode of delivery in early fetal growth restriction (EFGR)
Palma Reis C. et al	1.11 P	Indication and mode of delivery in late fetal growth restriction (IFGR)
Meneses T. et al	1.12 P	Last doppler evaluation prior to birth and mode of delivery
Patel M. et al	1.13 P	The detection rate of small for gestational age (SGA) babies and intrapartum outcomes- is there room for improvement?
Singh N. et al	1.14 P	Infant and maternal outcomes of pregnancies complicated by H1N1 infection needing ECMO therapy: a UK ECMO centre experience
Jindal S. et al	1.15 P	Increased impedance indices are seen in the umbilical arteries of twin fetuses in comparison to a singleton fetus: a fact or a myth!
Smyka M. et al	1.16 P	Relationship between gestational weight gain and pregnancy complications in pregnant women with excessive weight

Oral presentations (K = keynote; O = oral; PO = poster & short oral)

1.1 K PERINATAL AND LONG TERM OUTCOMES

Gene Dempsey - Professor of Paediatrics & Child Health, University of Cork, Ireland

Enhanced obstetrical and neonatal management has resulted in improved outcome for the most immature infants. Survival at 23 weeks is now approaching 30-50%, with survival rates greater than 90% for preterm infants delivered at 28 weeks gestation. Preterm delivery is associated with significant short term problems including brain injury, chronic lung disease and necrotizing enterocoloitis. Beyond the neonatal period there are longterm health and neurodevelopmental problems, including risks of cerebral palsy, cognitive problems and adverse longterm cardiovascular outcome amongst others.

Fetal growth restriction (FGR) refers to a condition where the fetus does not reach their biological growth potential in utero. Poor placental function would appear to be the greatest contributor to FGR. Previous observational studies have identified an association between absent reversed end diastolic flow and adverse neurological outcome such as reduced cognitive scores and motor impairment. More recently a number of important studies provide insight into neonatal and longterm outcome in the context of prematurity and FGR. These include the Growth Restriction Intervention Trial (GRIT)[1], the Prospective Observational Trial to Optimize Pediatric Health in IUGR (PORTO)[2] and TRUFFLE (Trial of Umbilical and Foetal Flow in Europe: TRUFFLE study)[3]. Whilst these may differ somewhat in the definition of FGR, they provide important information on the consequences of fetal growth restriction for the infant and these will be reviewed. Fetal growth restriction increases the risk of severe neonatal morbidity at each gestational age. Longterm neurodevelopmental outcome is also impacted.

In this overview we will review the consequences of fetal growth restriction primarily on brain growth and longterm neurodevelopmental outcome for the preterm infant through a combination of animal and human studies. Some studies have reported reduced brain volumes and altered cortical development during the neonatal period. Other studies have addressed the impact of fetal growth restriction on cerebral autoregulation in the preterm infant. The adverse effects of FGR on brain structure may have a variety of consequences for function in later life.

1.2 K PREMATURITY AND FETAL GROWTH RESTRICTION

Jennifer Zeitlin – Professor of Epidemiology, INSERM, Descartes University, Paris, France

European very preterm birth cohorts are an invaluable source of information about early onset fetal growth restriction as they provide population-based assessments of prevalence and short and long-term outcomes. In light of a new European project to set up a research platform including 18 existing European very preterm cohorts (the RECAP Preterm project), it is useful to reflect on the contribution of these cohorts to our knowledge about fetal growth restriction. Assessing trends over time is one of the benefits of repeated cohort studies and new results from two cohorts reveal an unchanging birthweight distribution among very preterm singleton live births over the past decade, but encouraging trends in short term outcome. Repeated cohort studies also make it possible to assess the stability of associations across time and populations, which can strengthen confidence in their validity. However, there are limitations inherent in the birth cohort study design for investigating fetal growth restriction, mainly the use of birthweight to define growth restriction, retrospectively collected pregnancy data (although these cohorts are prospective starting at birth) and sample truncation due to gestational age inclusion criteria.

1.3 O FETAL GROWTH CURVES IN EXTREME PRETERMS: PREDICTIVE PERFORMANCE FOR NEONATAL MORTALITY

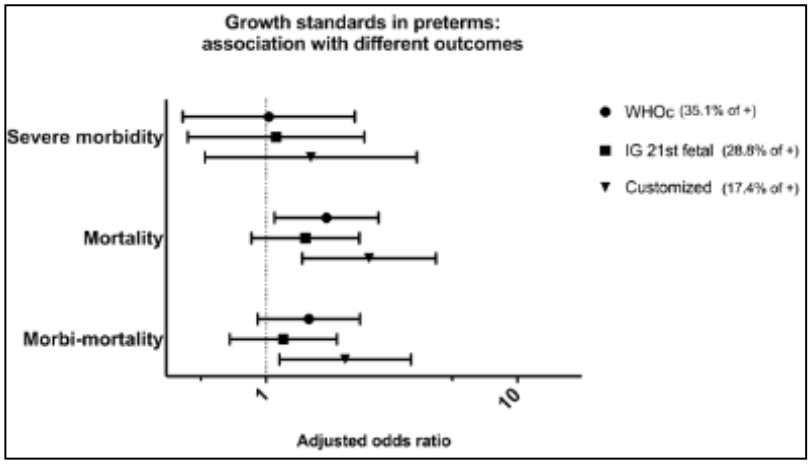
Mazarico E, Caradeux J, Gibert M., Figueras J, Iriondo M, Gómez Roig MD, Figueras F.
Barcelona Center for Maternal-Fetal and Neonatal Medicine, Barcelona, SPAIN

Objective: To compare the performance of customized growth assessment against Intergrowth-21st and WHO reference charts in extremely preterm babies.
Methods: A retrospective cohort was created of 507 consecutive extremely preterm babies (<28weeks) born between 2001-2015. Newborns were classified as small for gestational age (SGA) if birth-weight was below the 10th centile according to the different FETAL growth charts (customized, WHO AND Intergrowth-21st). Neonatal mortality was that occurring before 28 days of life. Diagnostic performance was assessed in terms of positive and negative likelihood ratios.
Results: The rate of neonatal mortality was 27% (137/507). The prevalence of SGA according to each curve was: 17.4% for customized growth charts, 28.8% for Intergrowth-21st charts and 35.1% for WHO charts.
Positive likelihood ratios for neonatal mortality were 1.40 (0.94 to 2.07) for customized charts, 1.20 (0.90 to .61) for Intergrowth-21st charts and 1.18 (0.91 to 1.51) for WHO charts. Negative likelihood ratios were 0.93 (0.84 to 1.02), 0.92 (0.81 to 1.05) and 0.91 (0.78 to 1.06), respectively.
Conclusion: In extremely preterm babies, the predictive performance for mortality of SGA is moderately better when defined by customized standards.

1.4 O SMALLNESS FOR GESTATIONAL AGE BY NON-CUSTOMIZED VS. CUSTOMIZED FETAL STANDARDS IN EXTREME PRETERM NEONATES: ASSOCIATION TO MORTALITY AND SEVERE MORBIDITY

Caradeux J[1-3], Masarico E[1], Basuki TR[1], Figueras J[1-2], Iriondo M[1-2], Gomez MD[1-2], Figueras F[1-2].
Fetal i+D Fetal Medicine Research Center, BCNatal - Barcelona Center for Maternal-Fetal and Neonatal Medicine (Hosp Clínic & Hospital Sant Joan de Deu), IDIBAPS, University of Barcelona, Spain. [2] Center for Biomed Research on Rare Diseases (CIBER-ER), Spain [3] Fetal Medicine Unit, Clínica Dávila, Santiago, Chile

Objective: To compare in extremely preterm neonates the association to the occurrence of mortality and severe morbidity of smallness-for-gestational age (SGA) as defined by non-customized versus customized fetal standards.
Methods: A retrospective cohort was created of consecutive extremely preterm babies (<28 weeks) born between 2001-2015. Newborns were classified as SGA if birthweight < 10th centile according non-customized (WHO growth charts, Intergrowth 21st for fetal weight) and customized fetal standards. Severe morbidity was defined as the occurrence of renal insufficiency, necrotizing enterocolitis, cardiac failure requiring inotropes or neurologic morbidity (seizures, severe intraventricular hemorrhage, hypoxic-ischemic encephalopathy, periventricular leukomalacia, or severe EEG abnormalities). Neonatal mortality was that occurring before 28 days of life. Odds ratios (OR) were adjusted for gestational at delivery, prenatal use of corticosteroids and magnesium sulfate by logistic regression.



Results: Among a total 507 extremely preterm babies the rates of severe morbidity, mortality and morbi-mortality were: 7.5% (38/507), 27% (137/507) and 29.8% (151/507). The prevalence of SGA according each curve was: WHO (35.1%), Intergrowth-21st for fetal weight (28.8%), customized growth assessment (17.4%). SGA was not associated with severe morbidity by any of the standards evaluated. Association with mortality was only significant for SGA defined by customized standards (OR 2.6 [95% CI 1.39-4.74]). Similarly the association to the composite severe morbidity or mortality was only significant for customized SGA babies (OR 2.1 [95%CI 1.13-3.77]).
Conclusion: In extremely preterm babies the association to adverse neonatal outcome of SGA is stronger when defined by customized standards.

1.5 O IDENTIFYING FETAL GROWTH TRAJECTORIES AND THEIR ASSOCIATION WITH MATERNAL AND CHILD CHARACTERISTICS: SECONDARY ANALYSIS FROM THE ROLO STUDY.

H Bartels, C O'Connor, R. Segurado, J Mehegan, Aisling Geraghty, Eileen O'Brien, F M McAuliffe
UCD Perinatal Research Centre, Obstetrics & Gynaecology, School of Medicine, University College Dublin, National Maternity Hospital, Dublin, Ireland

Objective: To identify fetal growth trajectories and to assess their association with maternal and child characteristics using baseline and 5-year post-partum follow up data from a randomised control trial of low glycaemic index diet in secundigravida patients with a previous baby >4kg ROLO study[i].

Methods: The ROLO recorded fetal ultrasound measurements at 20 and 34 week's gestation, and birth weight. Abdominal Circumference (AC), weight (Hadlock 4 Estimated Fetal Weight, or birth weight), a standardised proxy for length (femur length or birth length, individually standardised), and AC:length ratio (using standardised length proxy) were examined for trajectory classes using latent class trajectory mixture models. Two-, three-, four-, and five-class models were evaluated for fit, using a linear (first order) trajectory over three time-points. ANOVA and chi-square tests were applied to test associations between trajectory membership and maternal and age 5 child characteristics.

Results: No distinguishable classes were detected for Length. For abdominal circumference (AC), two fetal growth trajectories were identified, with 29% of participants on a slow trajectory and 71% on a fast trajectory. Those on a fast trajectory had higher rates of maternal impaired glucose tolerance (28.7% vs 16.5%, p<0.001) and higher rates of mean child 5 year BMI centiles (64th vs 58th centile, p<0.05) compared to those on the slow trajectory. For estimated fetal weight, four trajectories were identified, with 4% on a very slow trajectory, 63% in a moderate slow trajectory, 30% in a moderate-fast trajectory and 3% on a very fast trajectory (see figure). Mothers with a fetus on the fastest trajectory had a significantly higher BMI (mean 30 vs 26 p<0.002) higher antenatal glucose levels (p<0.05) and were more likely to deliver by caesarean section (59.1% vs 20%, p<0.001). At 5 year follow up, children on the fastest growth trajectory had the highest mean BMI centile (see table).

Table 1: fetal weight trajectory class and their relationship with maternal and child characteristics. Figures are in percentages unless otherwise stated.

		Glucose		Mode of delivery*		Child 5 year	
Weight Trajectory Class	Maternal BMI (kg/m2) *	Fasting Glucose (mmol/L) *	Impaired glucose Tolerance (%)*	SVD (%)	LSCS (%)	Weight (kg, mean) *	BMI centile*
Very Slow (4%)	26	4.4	24.1	82.8	17.2	18	56
Moderate-Slow (63%)	26.5	4.4	22.9	83.4	16.6	20.1	61.7
Moderate-Fast (30%)	26.7	4.4	28.5	78.6	21.5	20.6	63.7
Very Fast (3%)	30.6	4.6	38.1	40.9	59.1	22.5	86

***p<0.05**

Conclusions: This study shows specific fetal growth trajectories are associated with maternal BMI and maternal serum glucose, mode of delivery and child BMI. Diet and lifestyle measures that target maternal glucose levels during pregnancy may have lifelong benefits for children's BMI. Identifying those on an accelerated growth trajectory during fetal life provides a unique opportunity for antenatal and infant interventions that may have long-lasting health benefits.

[1] Walsh J et al, Low glycaemic index diet in pregnancy to prevent macrosomia(ROLO study): randomised controlled trial BMJ2012;345:e5605

2.1 K FETAL GROWTH STANDARDS: THE NICHD FETAL GROWTH STUDY APPROACH IN CONTEXT WITH INTERGROWTH-21ST AND THE W.H.O. MULTICENTRE GROWTH REFERENCE STUDY

Katherine Laughon Grantz, M.D., M.S.
Investigator, Epidemiology Branch, Division of Intramural Population Health Research *Eunice Kennedy Shriver* National Institute of Child Health and Human Development National Institutes of Health, USA

This presentation will compare & contrast conclusions from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Fetal Growth Studies with two recently completed international cohort studies that have developed fetal growth standards, INTERGROWTH-21st (INTERGROWTH) and the World Health Organization Multicentre Growth Reference Study (WHO Fetal), in light of differences in aims, sampling frames, and analytical approaches.

The INTERGROWTH and WHO Fetal studies were extensions of the WHO Multicentre Growth Reference Study (WHO MGRS) for infants and children, the aim of which was to create a single international reference for the best physiologic growth for children ages 0-5 years. WHO MGRS was predicated on the notion that breast-fed children of well-off parents represent optimal growth in size. The INTERGROWTH and WHO Fetal studies made the same assumption, i.e., that there would be no differences internationally among countries or racial/ethnic groups in fetal growth when conditions were optimal. INTERGROWTH found differences in crown-rump length and head circumference among countries, but interpreted the differences as not meaningful and presented a pooled standard. WHO Fetal presented country differences, but then a pooled standard along with discussion of the implications. Neither of the international studies tested for differences among racial/ethnic groups. The NICHD Study was designed to assess whether racial/ethnic-specific fetal growth standards were needed, in recognition of the fact that fetal size is commonly estimated from dimensions (head circumference, abdominal circumference, and femur length) where there are known differences in children and adults of differing racial/ethnic groups. Highly statistically significant racial/ethnic differences in fetal growth were found resulting in the publication of racial/ethnic-specific derived standards.

Despite all three studies including low-risk status women, the percentiles for fetal dimensions and estimated fetal weight (EFW) varied among the studies. Specifically, at 39 weeks, the 50th percentile for EFW was 3502 g for whites, 3330 g for Hispanics, 3263 g for Asians and 3256 for blacks in the NICHD Study, compared with 3186 g for INTERGROWTH and 3403 g for WHO Fetal. When applying these standards to a clinical population, it is important to be aware that different percentages of small- (SGA) and large-for-gestational age (LGA) fetuses will be identified. Ideally, a comparison of diagnostic accuracy, or misclassification rates, of SGA and LGA in relation to morbidity and mortality using different criteria is necessary to make recommendations. Identification of the appropriate percentile cut-offs in relation to neonatal morbidity and mortality is needed in local populations depending on which standard is used. On a final point, assessment of fetal growth with a one-time measurement remains standard clinical practice, despite recognition that a single measurement can only indicate size. At least two measurements separated in time are needed to estimate a trajectory, and perhaps one of the greater contributions of these prospective studies will be the ability to estimate fetal growth velocity. Preliminary work on fetal growth velocity from the NICHD Study will be presented. Ultimately, it is knowledge about fetal growth in addition to other factors and clinical judgment that should trigger intervention**.**

2.2 K INTERGROWTH AND THE STANDARDS IN EUROPE

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The INTERGROWTH 21st study aimed to develop prescriptive standards for newborn size to be used for clinical use and research globally by studying multi-national populations of healthy well-nourished women with uncomplicated pregnancies who were receiving adequate antenatal care. To assess implications of adoption of the Intergrowth birthweight standards in Europe, we used national data on gestational age, birthweight and sex for singleton births born at 33 weeks of gestation and over from 15 European countries in 2014 to compute the prevalence of SGA (<10th percentile) and LGA (>90th percentile) using INTERGROWTH's newborn birthweight standards and adjusted national references based on Gardosi's approach and Hadlock's foetal growth model. We then compared stillbirth and neonatal mortality rates for SGA and LGA infants using these different definitions. SGA prevalence using INTERGROWTH was 3% in Northern European countries (Norway, Estonia, Latvia, Finland) and 7% in Southern Europe (Spain and Portugal). The range for LGA was from 11-12% in Southern Europe to 30% in Northern European countries. For adjusted national models, rates were close to 10% for every country. Births reclassified as AGA using Intergrowth standards were at higher risk of stillbirth and neonatal death than those AGA by both references, while births reclassified as LGA using intergrowth were at equal or lower risk of mortality. Use of INTERGROWTH results in low proportions of SGA births and introduces significant disparities in the proportions of infants considered at risk across European countries which are not justified by the mortality rates of reclassified births. These results call into question the approach used by INTERGROWTH to describe prescriptive growth.

2.3 K THE W.H.O. FETAL GROWTH CHARTS

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Objective: Ultrasound biometry of fetal size has become an essential tool for identifying and managing fetal growth deviation, but available reference ranges have been based largely on single populations from high-income countries. In order to provide fetal growth charts for global use, WHO carried out a multinational study.
Method: A multinational prospective observational longitudinal study recruited 1439 healthy women with a low-risk singleton pregnancy were recruited provided they had education and unrestricted nutritional, economical, and social background. They were followed at 10 centers (Argentina, Brazil, Democratic Republic of Congo, Denmark, Egypt, France, Germany, India, Norway, and Thailand) and were scheduled for 7 ultrasound sessions measuring bi-parietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL), and estimated fetal weight (EFW) was calculated based on formula 3 by Hadlock et al. Quantile regression was used to estimate percentile development during pregnancy.
Results: 1362 participants entered the statistics. There were differences between countries concerning gestational age at birth ($p<0.001$) and birthweight even after adjusting for gestational age ($p<0.001$).
1. In spite of optimized maternal conditions, normal fetal growth is not uniform but demonstrates wide variation.
2. Growth variation is asymmetric in the population; during the second half of gestation, distribution is wider above than below the 50th percentile.
3. Fetal sex influences the growth percentiles 3.5-4.5%.
4. Maternal age, parity, height and weight influence EFW percentiles but rarely more than 2% each.
5. These maternal covariates have differential effect across percentiles.
6. Significant differences in EFW and growth trajectories among countries were only partly explained by maternal factors.
Conclusion: These growth charts are available for international use and acknowledge individual and population variation. To refine local clinical use, adjusting for fetal sex, and maternal and country factors may be considered.

2.4 K CUSTOMISED GROWTH CHARTS FOR GLOBAL APPLICATION

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Customised charts predict the individual growth potential for the assessment of fetal growth and birthweight, by 1. adjusting for physiological characteristics (maternal height, weight, parity and ethnic origin) 2. excluding pathological factors, so as to better detect if growth IS affected by pathology and 3. using a fetal weight based curve to define the trajectory and normal limits of growth. Using information available at the beginning of pregnancy, the GROW (gestation related optimal weight) software produces a personalised chart on which to record and monitor fundal height and estimated fetal weight measurement until delivery, and a centile calculator to assess the birthweight centile.

Compared to population based, 'one-size-fits-all' fetal weight and birthweight standards, customised charts improve the association between babies categorised as SGA or LGA and adverse outcome. By adjusting for constitutional variation, they increase the identification of pregnancies at risk due to growth abnormalities, and reduce false positives alerts. As a result, surveillance using GROW increases clinical confidence, which has resulted in enhanced antenatal detection of SGA babies. This in turn has led to reduction in stillbirths in areas in England which have introduced GROW charts as part of the GAP training and audit programme.

Recent work has focussed on defining additional ethnic or country of origin codes. Multi-ethnic databases from 25 countries with over 3 million births have been collected and analysed, and this has led to coefficients for 105 ethnic origin groups. The new Global GROW chart and centile calculator will be launched in autumn 2017.

2.5 O DO GERMAN NEWBORNS FOLLOW THE INTERGROWTH CHARTS AS POSTULATED? - A COMPARISON WITH CORRESPONDING DATA FROM HESSEN/GERMANY

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[4.]Department of Medical Biometry, Philipps-University Marburg, Germany

Objective: To evaluate the performance of the INTERGROWTH Newborn Standard references with data from a current German Perinatal data base registry.
Methods: A German Perinatal data base of Hessen between 2000 and 2012 was used to establish customized birthweight values. Data between 2000 and 2015 were used applying similar exclusion criteria as in INTERGROWTH for comparison.
Results: Among the remaining 235 918 German singleton live births between 2000 and 2015, 0.7% were < the 3rd centile and 7.0 % > the 97th centile, respectively, of the INTERGROWTH standard. Infants <3rd and >97th centile according to INTERGROWTH had a neonatal admission rate of 361/1000 and 66/1000 births, respectively (whole population: 63/1000) and a perinatal mortality rate of 6 and 0.3/ 1000 live births (whole population: 0.24/1000).
Conclusion: The centile distribution of the INTERGROWTH Standards is left shifted compared with the German reference. This shift alters awareness and outcome frequencies. Further outcome-based research is required for defining abnormal growth categories before the INTERGROWTH Newborn Standards can be used. Therefore, we have established German customized birthweight-for-gestational age references (200-2012) which will be introduced and their validity will be calculated with data from 2013-15 and compared to INTERGROWTH.

2.6 O IDENTIFICATION OF PLACENTAL INSUFFICIENCY IN A COHORT OF STILLBIRTHS – EVALUATION OF PERFORMANCE OF CUSTOMISED (GROW) AND INTERGROWTH-21ST BIRTHWEIGHT STANDARDS

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Objective: Being small for gestational age (SGA) is an important risk factor for stillbirth. SGA is frequently a sign of underlying placental dysfunction, which if identified can then prompt further investigation and timely birth. Our aim was to compare customised (GROW) and INTERGROWTH-21st birthweight charts in identifying cases of placental insufficiency in a cohort of women with late stillbirth (≥28 weeks).
Methods: The Midlands and North of England Stillbirth Study recruited 299 women with late stillbirth. The cause of stillbirth was assigned using ReCoDe by two members of the research team. Stillbirths were sub-grouped into those resulting from placental pathology or attributed to other causes. Birthweight centiles were calculated using gestation at time of stillbirth with GROW and INTERGROWTH-21st software. This study compared the ability of birthweight < 10th centile by each criterion to identify placental pathology as defined by ReCoDe.
Results: Placental pathology was identified using ReCode in 139 (46.5%) cases of late stillbirth. 134 (44.8%) stillborn infants had a birthweight <10th centile by GROW compared with 80 (26.8%) by INTERGROWTH-21st standards. SGA by GROW had higher sensitivity for placental pathology than INTERGROWTH-21st, 59.7% vs. 38.8% respectively, whereas INTERGROWTH-21st had higher specificity 83.8% vs. 68.1% respectively. Thirty-one (22.3%) cases with placental pathology were identified as SGA only by GROW and two cases (1.4%) only by INTERGROWTH-21st standards.

		Placental Insufficiency					Placental Insufficiency		
		Yes	No	Total			Yes	No	Total
IG21	SGA	54	26	80	GROW	SGA	83	51	134
	AGA	85	134	219		AGA	56	109	165
	Total	139	160	299		Total	139	160	299

Conclusion: SGA by GROW is more sensitive than SGA by INTERGROWTH-21st for identification of placental pathology in pregnancies that end in late stillbirth. Our findings support accumulating evidence that customised standards have higher sensitivity to identify pathological growth restriction than the INTERGROWTH-21st standard but that false positive diagnoses are higher than with INTERGROWTH-21st. Our findings also demonstrate that placental pathology occurs frequently in late stillbirths with birthweight > 10th centile.

4.1 K RISK FACTORS AND APPROACHES TO PREVENTION OF SGA

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Major risk factors for small for gestational age (SGA) present in early pregnancy include: previous SGA or stillborn infant, maternal chronic hypertension, renal or autoimmune disease, diabetes with vascular disease, age >40, smoking (especially >10 per day), drug abuse, and low PAPPA. Late pregnancy risk factors include abnormal fundal height measurements (low or crossing centiles), hypertensive disease and unexplained antepartum haemorrhage. These risk factors are generally considered to be indications for serial growth scans in pregnancy. In women with major early pregnancy risk factors for SGA low dose aspirin (LDA) started by 16 weeks' reduces the risk of SGA. Administration of LDA in the evening is more effective than in the morning for prevention of SGA and preeclampsia.

Smoking cessation early in pregnancy is associated with SGA rates similar to non-smokers and cessation later in pregnancy is associated with an increase in birthweight compared to smokers. The most effective strategies to reduce smoking in pregnancy include incentive based programs and opt-off referral (rather than opt-in) to smoking cessation services. Smoke free legislation also improves pregnancy outcomes. Folic acid taken prior to pregnancy also reduces the risk of an SGA infant and should be a goal for all women planning a pregnancy.

4.2 O ADDED VALUE OF MATERNAL PERCEIVED STRESS AS A PREDICTOR OF SMALL FOR GESTATIONAL AGE

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Objective: To assess the added value of maternal perceived stress as a predictor of small for gestational age (SGA).
Methods: Cross-sectional study including 100 patients with diagnosis of SGA and 100 controls. Stress was measured by the Perceived Stress Scale. Stepwise logistic regression was performed to create a model based on maternal characteristics and compare it to a second model based maternal characteristics and perceived stress score. Diagnostic performance for both model was assessed by receiver characteristic curve (ROC) analysis and compared by DeLong Method.
Results: Mean gestational age was 38 (SD 2) years. Stress score was higher in the SGA group (24±9 vs 20±7; p=0.002). There were more smokers (29% vs 10%; p=0.001) and nulliparous women (67% vs 32%; p<0.01) in the SGA group. Also, maternal age was lower in the SGA group (32±5 vs 34±5; p=0.003) as well as BMI (22±0.4 vs 23±0.4; p=0.017).
Base model comprised maternal age, BMI, smoker and nulliparity. R^2 for base model was 13.4% with an area under the curve (AUC) of 0.7243. Adding perceived stress score to the base model yielded an R^2 of 15.48%. AUC for the stress model was 0.7515. Comparison of both curves by DeLong method was not statistically significant (p=0.08)
Conclusions: There is a relationship between maternal perceived stress and the diagnosis of small for gestational age. Nonetheless, adding maternal stress to a base model did not improve the prediction of SGA.

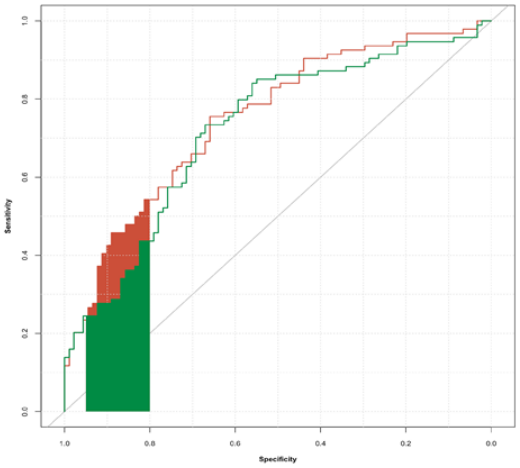

Figure 1. ROC curves for basal and stress model

4.3 O MATERNAL VITAMIN D STATUS IN THE FIRST TRIMESTER OF PREGNANCY AND RISKS OF HAVING A SMALL-FOR-GESTATIONAL AGE OR PRETERM BIRTH: PROSPECTIVE COHORT STUDY

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Objective: Randomized controlled trials with small samples and observational studies have reported an association between vitamin D and low birthweight, but whether vitamin D has an impact on small-for-gestational age (SGA) or preterm birth remains controversial. We investigated the association between vitamin D status in the first trimester of pregnancy and the risks of SGA and preterm birth.
Method: We used a prospective cohort study of 2813 women with a singleton pregnancy recruited before 11 weeks of gestational age (GA) in 5 French and one Belgium maternity units between April 2012 and July 2014. First trimester 25[OH]D levels were assessed as a continuous variable, in quartiles and using clinical cut-offs (<20, 20-29, 30+ ng/ml). SGA was defined as a birthweight <10th percentile using French intrauterine references. Preterm birth was a GA <37 weeks. We estimated odds ratios (OR) adjusting for maternal age, parity, pre-pregnancy body mass index, ethnicity, smoking, medical risk factors of SGA (history of SGA, hypertension, pre-eclampsia...) and season of blood draw.
Results: Mean 25[OH]D was 22.2 (SD=10.3) and 23.0% and 45.1% of women had low levels (Q1 <14 ng/ml and <20 ng/ml, respectively). 11.9% of women had a SGA infant and 6.7% had a preterm birth. Mean 25[OH]D levels differed for women with a preterm (20.6) versus a term (22.3) delivery (p=0.03), but not a SGA infant (p=0.89). Compared to women in the 4th Quartile (>29+ ng/ml), adjusted OR for SGA were 1.2 (0.9, 1.7) and 1.0 (0.7, 1.4) for a concentration of 25[OH]D <14 ng/ml (Q1) and between 14-20 ng/ml (Q2), respectively. The adjusted OR for preterm birth were 1.6 (0.9, 2.5) and 1.4 (0.9, 2.2), with a significant trend over the 4 quartiles (p=.012).
Conclusion: Low maternal vitamin D levels in the first trimester of pregnancy were related to risks of preterm birth, but not SGA.

4.4 O THE INTRODUCTION OF A "GAP" (GROWTH ASSESSMENT PROTOCOL-CUSTOMIZED GROWTH CHART) FOR THE FIRST TIME IN THE REPUBLIC OF IRELAND – THE GOOD, THE BAD AND THE UGLY

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Fetal growth restriction(FGR) is associated with stillbirth(SB). Our unit introduced "GAP" with the aim of improving antenatal recognition of FGR to reduce SB rates.

A business case was presented to management. Project leads were identified at Midwifery/Consultant level, they underwent training at UK Perinatal Institute, and then educated our Multidisciplinary team. "Change champions" were assigned. "GROW" software was introduced. Data was collected retrospectively to produce customized growth centiles for our population. Our rate of FGR, and recognition rate of FGR were obtained. Women were risk assessed and criteria developed for referral for serial growth ultrasounds(USS). EDD was based on dating USS. Consultant visits moved from 24 to 26/40. "GAP" went live 03/01/2017. Customized growth charts were generated at booking and placed in charts. Symphysiofundal height(SFH) +/-Estimated fetal weight(EFW) was plotted at all visits from 26/40. Tools for plotting were placed in clinical areas.

Initially "GAP" was met with reluctance, this was overcome by encouragement of "change champions". 73% of staff trained within four weeks. Training consisted of 2 hour generic sessions, followed by eLearning. Attendance was affected by Rota constraints. Editions to categories of "ethnicity" were required. Inputting data and generating "GAP" charts required more time initially. Appropriate equipment(T-square) is required for accurate plotting of SFH/EFW. Compliance with "GAP" was suboptimal initially. Reasons included difficulty finding "GAP" within the chart, lack of directed training to users (i.e. generating charts versus plotting on charts).

Introduction of "GAP" requires communication and engagement at all levels, and support, enthusiasm and encouragement from senior staff. Training needs to be focused/directed to users and continuous due to the nature of staff turnover. Introduction of a Tab to identify the "GAP" improves compliance. In the short term introduction of a "GAP" requires extra resources and manpower, but in the long term this could improve recognition of FGR, and ultimately reduce SB rates.

4.5 O MISSED CASE AUDIT OF BABIES BORN SMALL FOR GESTATIONAL AGE

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Background: Babies that are failing to fulfil their in-utero growth potential are at significantly increased risk of perinatal morbidity and mortality. Yet audits of current performance show that the majority of babies born small for gestational age (SGA) have been missed during antenatal care. We wanted to improve our understanding of the reasons for these misses using GAP-SCORE, an audit tool which is part of the Growth Assessment Protocol (GAP) program.

Method: GAP-SCORE has bespoke questions on assessment of risk factors and surveillance of fetal growth during pregnancy, against RCOG and NHS Care Bundle guidelines. Based on the information entered, the application derives a list of factors responsible for SGA not having been recognised. The tool is supplied with the recommendation that the first 10 births with undetected SGA birthweight (<10th customised centile) are reviewed in each 6 month period.

Results: A total of 1541 SGA births were entered in 43 Trusts & Health Boards across England, Wales & Northern Ireland between October 2015 and March 2017. The average birthweight centile was 5.0. (range 0-9.9). A total of 58.3 % of pregnancies in this cohort had indications for serial scanning according to NHS guidelines, but this was done in only 35.3% of cases. The median number of scans was 3, with a median interval between last scan and delivery of 22.4 days. The table shows the respective frequencies of the main categories of missed SGA cases which were identified by GAP-SCORE.

Category	N	%
High risk ➔ serial scans during third trimester	544	35.3
High risk but NO serial scans during third trimester	354	23.0
Low risk but had scan for indications during third trimester	297	19.3
Low risk and no referral for scans during third trimester	346	22.4
Total	**1541**	**100**

Conclusion: GAP-SCORE identified problems with ultrasound service provision in the majority (78%) of cases in this unselected cohort: scans were either not offered despite indications, or provided but still failed to detect SGA. Increased quality and availability of ultrasound, together with adherence to recommended protocols will underpin improvements in antenatal detection.

5.1 K FETAL GROWTH RESTRICTION AMONG STILLBIRTHS AND ITS ANTENATAL DETECTION IN IRELAND: A NATIONAL CLINICAL AUDIT

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Objective: We sought to estimate the prevalence and the level of antenatal detection of fetal growth restriction among stillbirths in Ireland.
Method: As part of a national clinical audit of perinatal mortality, contributors in all 20 Irish maternity units completed and submitted detailed notification forms related to stillbirths in 2011-2015. We calculated the stillbirth rate per 1,000 births using several criteria for defining stillbirths. We derived customised birthweight centiles using the Gestation Related Optimal Weight (GROW) software. Stillbirths <10th customised birthweight centile were considered small for gestational age (SGA) and those <3rd centile were considered severely SGA.
Results: There were 1,547 notifications of stillbirths delivered in 2011-2015 after 24 weeks gestation or with a birthweight ≥500g. Depending on the case-definition criteria, the stillbirth rate ranged from 3.4 to 4.7 per 1,000 births. Forty-two percent (637/1535) of the stillbirths were severely SGA and 54.6% were SGA (837/1535). SGA was more prevalent among the stillbirths complicated by multiple pregnancy, maternal hypertension and congenital anomaly and in stillbirths delivered pre-term. Antenatal detection was at 20% (167/833) for SGA and 25% (478/633) for severe SGA. Antenatal detection in the 20 maternity units was broadly consistent with the national level. Antenatal detection varied little across a range of factors but was almost twice as common if a congenital anomaly was present (29% vs. 16%).
Conclusions: Antenatal detection of fetal growth restriction among stillbirths in Ireland is poor. Standardised ultrasound services involving two examinations and customised fetal growth charts should be provided for all pregnant women in Ireland.

5.2 K SAVING BABIES' LIVES PROJECT IMPACT AND RESULTS EVALUATION (SPIRE): A MIXED METHODOLOGY STUDY

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Reducing stillbirth and early neonatal death is a national priority in the UK. Current evidence indicates this is potentially achievable through application of four key interventions within routine maternity care delivered as the National Health Service (NHS) England's Saving Babies' Lives care bundle. However, there is significant variation in the degree of implementation of the care bundle between and within maternity units and the effectiveness in reducing stillbirth and improving service delivery has not yet been evaluated. This study aims to evaluate the impact of implementing the care bundle on UK maternity services and perinatal outcomes.

The Saving Babies' Lives Project Impact and Results Evaluation (SPiRE) study is a multicentre evaluation of maternity care delivered through the Saving Babies' Lives care bundle using both quantitative and qualitative methodologies. The study will be conducted in twenty NHS Hospital Trusts and will include approximately 100,000 births. To determine the impact of the care bundle on pregnancy outcomes, birth data and other clinical measures will be extracted from maternity databases and case-note audit from before and after implementation. Additionally, this study will employ questionnaires with organisational leads and review clinical guidelines to assess how resources, leadership and governance may affect implementation in diverse hospital settings. The views and experiences of service users and service providers towards maternity care in relation to the care bundle will be also be sought using questionnaires.

This study will provide useful practice-based evidence which will advance knowledge about the processes that underpin successful implementation of the care bundle so that it can be further developed and refined.

5.3 O PREVALENCE OF 'DISORDERS OF FETAL GROWTH' AND ASSOCIATED MATERNAL/OBSTETRIC CONDITIONS IN THE WEST MIDLANDS ACCORDING TO THE ICD-PM CLASSIFICATION.

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Objective: Recent international work has led to the development of a perinatal death classification (ICD-PM) which is aligned to the International Classification of Diseases (ICD10) and is promoted by WHO as the new standard to classify and improve our understanding of perinatal deaths. We wanted to apply this system to a cohort of perinatal deaths in the West Midlands, to determine the prevalence of the ICD category of 'Disorders of Fetal Growth' in this population.
Method: The database constituted 10,300 routinely collected and ICD coded perinatal mortality data from 1997 to 2012. Each case was assigned a fetal/neonatal code as well as a maternal/obstetric code. Birthweight – for -gestation centiles were assigned using customised GROW software; for antepartum stillbirths, 2 days were deducted from gestational age at delivery.
Results: The cohort included 4936 (47.9%) antepartum (AP) stillbirths, 497 (4.8% intrapartum (IP) stillbirths, and 4867 (47.3%) neonatal (NN) deaths to 28 days. Disorders of fetal growth were the largest category overall (36.4%) and accounted for 43.5% of AP, 27.4% of IP and 30.2% of NN deaths, respectively. Most growth disorder cases were SGA (<10^{th} GROW centile): AP: 87%, IP:97%, NN:87%. ICD codes were assigned for maternal/obstetric categories and are presented in the Table.
Conclusion: Disorders of growth are a preponderant cause of perinatal death. In most cases, there was no associated maternal / obstetric condition.

5.4 O CUSTOMISED CENTILES AND REDUCTION OF STILLBIRTH RATE AT A SOUTH INDIAN PERINATAL INSTITUTE

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Objective: To study the effect of Growth Assessment Protocol (GAP) on the stillbirth rate.
Methods: Prospective interventional study over two years, April 2015 to April 2017 at Fernandez hospital, which is a tertiary perinatal institute with 8000 deliveries annually. The customised centiles were created using our normative database by the Perinatal institute, and GAP protocol was introduced with prior certification and training in April 2015. Fetal growth restriction (FGR) detection rates were calculated retrospectively for a year before introduction of GAP. Study population was singleton pregnancies, which had booked for antenatal care at the hospital, excluding referrals, and unbooked women. The primary outcome was stillbirth rate and secondary outcome was its impact on FGR detection rates, and FGR related stillbirths.
Results: The annual number of deliveries was 8192, 7822 and 8397 for the years 2014, 2015 and 2016 respectively. The overall stillbirth rates fell from 13.7 to 10 per 1000 births of more than 24 weeks from 2014 to 2016 (including referrals, multifetal pregnancies). For booked singleton births, the stillbirth rate fell from 7.2 to 5.1 for more than 24 weeks. The impact was more significant for more than 28 weeks gestation with a fall from 4.3 to 2.5 per 1000. The FGR detection rates increased from 46% at the start of the GAP project to 70% over two years.
Conclusions: The stillbirth rates decreased with the use of GAP, with an increase in the FGR detection rates of 20%. Incorporation of training to increase sensitivity to FGR risk factors, SFH measurement and use of customised GROW charts did result in decrease in stillbirth rate.

5.5 O REDUCING STILLBIRTHS IN NORTH ENGLAND: THE SABINE PROJECT

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Perinatal Institute, United Kingdom

Background: Babies with fetal growth restriction are at significantly increased risk of stillbirth, and antenatal detection reduces the risk significantly. The Saving Babies in North England (SaBiNE) project was an NHS North England funded intensive training and implementation programme of the Growth Assessment Protocol (GAP) to address the high stillbirth rates in the three North England regions.
Method: The project included 40 Trusts and 52 Designated Clinical Midwives (DCMs), each seconded for 135 hours taken flexibly over a 4-month period. Intensive training workshops were held for over 150 staff. The DCMs were tasked to implement the GAP programme through

- Introduction of standardised protocols including early pregnancy risk assessment using the NHS England Saving Babies Lives algorithm
- Enhanced local training in fundal height measurement, plotting on customised growth charts and standardised protocols for referral
- Rolling audit of antenatal referral and detection rates of babies born small for gestational age (SGA)

Results: Implementation of the programme resulted in a near 50% increase in antenatal referral for suspected SGA (true positive), from 36.5 to 53.1%. At the same time, false positive referrals (birthweight not SGA) stayed essentially the same (15.9 and 17.1%). Antenatal detection by scan-EFW increased 2.3-fold, from 18.5 to 42.7%. Each of the three participating regions (North East, North West and Yorkshire and the Humber) reduced their 2015 stillbirth rates to the lowest ever level in their respective region, while such changes were not evident in the rest of the country over the same period (see Figure). Taken together, the reduction in stillbirths from 4.84 to 4.37 / 1000 was statistically significant and represented a 10% reduction in a single year.
Conclusion SaBiNE demonstrated that local implementation of evidence based protocols can result in a demonstrable improvement in antenatal recognition of fetal growth problems and was associated with a reduction in stillbirth rates.

5.6 O REDUCING STILLBIRTH BY FETAL GROWTH SURVEILLANCE

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Objective: Pennine Acute NHS Trust in the North West of England delivers more than 10,000 babies per year. Saving Babies in North England (SaBiNE) is an NHS North of England funded initiative to assist with the implementation of the Growth Assessment Protocol (GAP) as a part of the Saving Babies Lives NHS Care Bundle. The aim is to reduce stillbirth through a focus on identification and surveillance of fetal growth restriction, a major cause of unexplained stillbirth. We share our experience of implementing the SaBiNE project and it's impact on the existing services.
Methods: Guideline was based on the Saving Babies Lives NHS England care bundle and the RCOG Small for Gestational Age guideline. A cost analysis for it's implementation showed the need for 7000 additional scans/ year. We secured £300,000 funding in the form of CQUIN from the local CCG in order to implement the project over a 2 year time period. A staff and patient survey was undertaken in order to assess the acceptability of this increased surveillance and interventions to facilitate elective delivery.
Results: SaBiNE resulted in a significant reduction in stillbirths and early neonatal deaths, accompanied by a small increase in the overall rate of induction of labour (8%) and caesarean section (3%). There was a 47% increase in the scan demand, which was less than expected as some of high risk women were already under surveillance.
Most women found the extra scans acceptable and understood the purpose of the policy.
Conclusion: Fetal growth surveillance significantly reduces stillbirth rates and has a high patient acceptability rating. The national shortage of trained sonographers and limited scan capacity in most units makes implementation difficult. This audit will assist in further refining the pathway enabling better targeting of high risk women and allowing better allocation of resources.

5.7 O REDUCING STILLBIRTH – IMPLEMENTING THE 'SAVING BABIES' LIVES' CARE BUNDLE REDUCES RATES OF STILLBIRTH AND EARLY NEONATAL DEATHS

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Giving birth in the UK has never been safer, but stillbirth rates are among the highest of all high-income countries at 4.7 per 1000 births. The 2016 national maternity review identified a care bundle as good practice in reducing stillbirths. This Saving Babies' Lives care bundle brought together four elements that are recognised as evidence-based and/or best practice for care, thus targeting risk factors that are associated with increased stillbirth rates. This was implemented at Salisbury District Hospital with the aim to reduce the number of stillbirths and early neonatal deaths, and to identify learning from case reviews of growth restricted babies that were not detected during pregnancy.

The care bundle elements are: 1. Reducing smoking in pregnancy – carbon monoxide testing all women at booking and referring all who smoke or are exposed to tobacco smoke to opt-out smoking cessation 2. Risk assessment and surveillance for fetal growth restriction – use of an algorithm to aid risk categorisation, referring all high risk women for serial ultrasound scans, and plotting estimated growth on customised growth charts using the Growth Assessment Protocol (GAP) programme. 3. Raising awareness of reduced fetal movements (RFM) - giving information leaflets and discussing at every contact, plus a strict protocol for management of women presenting with RFM. 4. Effective fetal monitoring during labour – all staff caring for labouring women were required to undertake annual cardiotocography (CTG) interpretation training and a buddy system for reviewing and escalating concerns was implemented The elements were audited quarterly throughout the year and compliance and implementation of all aspects improved as the year went on.

Overall for the year 2016/17, there were 3 stillbirths compared to 14 the previous year, and 1 early neonatal death completed to 3 the previous year. This represents a 78% reduction in stillbirths and 66% reduction in early neonatal deaths over 12 months.

5.8 O UNDERSTANDING EACH STILLBIRTH: A WAY FORWARD TO "SAVING BABIES LIVES"

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Sam Tinkler – Midwife; United Lincolnshire Hospitals NHS Trust, UK

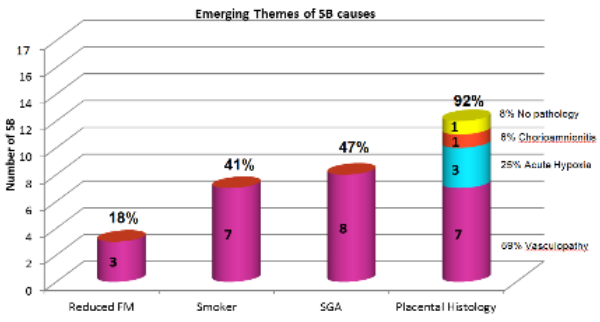
Objective: Having an understanding of why each baby died is a key to tackling the burden of stillbirths (SB). Saving Babies' Lives is a care bundle produced by NHS England to support providers, commissioners and professionals to take action to reduce SB. Our study aims to fulfil the following objectives:

- To Understand the burden of SB by looking at their rate.
- To Capture trends and identify common themes by reviewing each SB.
- To Use this information in guiding the principles of Saving Babies' Lives care bundle.

Method: Each SB was individually investigated alongside the recommended national perinatal mortality toolkit. We collated all the individual reports of the SB (gestation age >28weeks) of our unit within the last three years (from 2014 to 2016) and analysed the information to evaluate both the processes and the outcomes.

Results: The SB rate/ 1000 births in our unit was 5.2(2014), 3.4(2015) and 4.7(2016) respectively. During our analysis, we identified smoking, reduced fetal movements, small for gestation age (SGA) and placental vasculopathy as the prevalent themes contributing to SB.

Reduced fetal movements were observed to be a contributing factor in 18%. 41% continued to be smokers at the time of birth despite being referred to smoking cessation services at booking. 47% of fetuses were identified to be SGA at birth. As illustrated in the bar chart, amongst the placentae which were sent for histology, 92% were found to have a form of pathology. Vasculopathy (infarction) was the most common (59%), followed by acute hypoxia (ischaemia) in (25%) and (8%) had evidence of chorioamnionitis.



Conclusions: We are using this information to guide our action plans and inspire local solutions to prevent SB. Some quality improvement strategies are either already in place or are being implemented. These are Traffic Light Stickers for reduced fetal movements, Focused groups for smoking cessation referrals, Adoption of customised growth charts and including Doppler studies in all our growth surveillance scans. The process of shared learning is timely undertaken by identified champions.

6.1 K PLACENTA IN EARLY AND LATE ONSET INTRAUTERINE GROWTH RESTRICTION.

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The 2014 Amsterdam consensus meeting on placental pathology was an example of recently increasing efforts to improve the quality and consistency of placental pathology reporting. As part of this process, agreement is evolving on more consistent definitions of placental lesions, how these lesions provide evidence for different pathological processes and how these pathological processes relate to specific clinical phenotypes, including intrauterine growth restriction (IUGR).

Placental pathology remains complex however and there is a need for pathologists, obstetricians and researchers to understand what these newly clarified terms really mean, how they should be interpreted in practice and what the limitations of our current knowledge are.

After providing a brief overview of current placental pathology classification, there will be a focus on a practical approach to reporting placental pathology in IUGR that will demonstrate the benefits of these newer methods of placental pathology classification. In this proposed approach emphasis is placed on pathological processes (e.g maternal vascular malperfusion or fetal vascular malperfusion) rather than individual placental lesions (e.g. infarcts, vascular thrombi). This allows for construction of simpler, less descriptive and more consistent pathology reports. As different pathological processes may be associated with growth restriction, and as multiple processes may be at work in an individual case, the implications of this complexity for interpreting findings in individual cases and for growth restriction research will be discussed. The importance of communicating clinical information will also be emphasised, along with the potential benefits of multidisciplinary team discussions.

6.2 O PLACENTAL CHANGES IN DIABETIC STILLBIRTHS

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Objective: Stillbirth has numerous associated risk factors and placental pathologies. However, the predictive value of these factors is low as they are also seen in live births. One such factor is maternal diabetes which is associated with a 4-fold increased risk of stillbirth. This study aimed to elucidate the spectrum of placental pathology associated with diabetes, and whether this is more profound in diabetic pregnancies which end in stillbirth.
Methods: Histological techniques were carried out on slides cut from representative blocks of placental parenchyma from different clinical conditions; normal live births, diabetic live births, unexplained stillbirths and diabetic stillbirths. Photomicrographs were taken and examined to assess placental vascularity (CD31), proliferative index (Ki67), syncytial nuclear aggregates (H&E). cytokeratin area/nuclear area (CK7) and avascular villi (CD31). Histopathological data were extracted from clinical reports.
Results: Stillbirths had an increased CK7 area compared to normal live born cases with unexplained stillbirths being significantly raised compared to live births (*p=0.005*) and diabetic stillbirths significantly raised compared to diabetic live births (*p=0.0008*). Proliferative index was significantly lowered in cases of unexplained stillbirth compared to normal live born cases (*p=0.04)*. There was no difference in placental vascularisation in diabetes. Additionally, 80% of unexplained stillbirth placentas were classified as normal and 90% of diabetic stillbirth placenta presented with maturation disturbance based on histopathological examination.
Conclusion: Diabetic stillbirths have similar phenotype to that of live born controls, however, the increased CK7 area of diabetic stillbirths when compared to diabetic live births points towards the role of increased distance between fetal capillary walls and the trophoblast basement membrane playing a crucial role in outcome when pregnancy approaches term. Data gathered from unexplained stillbirths indicates an unknown mechanism for stillbirth or a non-placental cause in these cases that cannot be determined by routine histopathological examination alone.

6.3 O PLACENTAL AND UMBILICAL CORD MORPHOMETRY OF PREGNANCIES WITH SMALL FOR GESTATIONAL AGE INFANTS

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Objective: Multiple factors contribute to infants being small for gestational age (SGA), including placental and umbilical cord (UC) abnormalities. Research focuses on timely antenatal detection of SGA, to reduce associated risks of perinatal mortality and morbidity. We aimed to examine different morphological characteristics of the placenta and UC, focussing on pregnancies with SGA infants.

Method: This prospective cohort study examined 1005 placentas from consecutively delivered singleton pregnancies in a tertiary centre. Standardised images of each placenta were taken. Measurements on gross examination included placental weight and thickness; umbilical cord length, diameter and handedness. Distance from placental cord insertion site to placental margin, length and breadth of the placenta and placental chorionic surface area were measured digitally using ImageJ software. Birthweight and gestational age were recorded. Classification and regression models were used to identify the best subset of measurements to correctly classify infants as SGA (<10th centile).

Results: Overall, 141 (14%) infants were SGA. A regression model with maternal age, placental weight, surface area and birthweight to placenta weight ratio correctly classified 98% of infants >10th centile and 47% of infants <10th centile. Of the potential antenatal measurements, diameter of UC (placental and fetal ends), and distance from placental cord insertion to placental margin were statistically significant ($p<0.05$) predictors after adjusting for maternal age, with smaller diameters and shorter distances associated with increased odds of SGA.

Conclusion: SGA infants can be identified using placental and UC morphometry. Further research on antenatal detection may improve our understanding of the pathophysiology and contribute as predictors for SGA.

6.4 O ABNORMAL PLACENTAL CORD INSERTION AND ADVERSE PREGNANCY OUTCOMES: RESULTS FROM A PROSPECTIVE COHORT STUDY

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Objectives: To prospectively measure the distance from the placental cord insertion (PCI) site to the placental margin using digital imaging and to examine the association between abnormal PCI and adverse pregnancy outcomes in singleton pregnancies.

Methods: This prospective cohort study examined 1005 placentas from consecutively delivered singleton pregnancies in a tertiary center. Standardized images of each placenta were taken and digital measurement performed using ImageJ software.

Results: The rates of velamentous (insertion into the membrane) and marginal (<2cm from placental margin) cord insertions in a total of 1,005 singleton pregnancies were 3.6% (n = 36; 95% CI = 2.5–4.9%) and 6.4% (n = 64; 95% CI = 4.9–8.1%), respectively. Abnormal PCI was found to be more common among smokers compared to non-smokers (22.7% vs. 14.8%, P=0.04). Abnormal PCI was found to be significantly associated with small for gestational age (adjusted OR 1.73; CI 1.01-2.97, P=0.047) and low birthweight infants (adjusted OR 3.87; CI 1.72-8.71, P=0.001).

Conclusions: Digital imaging analysis using ImageJ software mapped the surface of the placenta and provided objective measurement of PCI site. In this large prospective cohort, abnormal PCIs were significantly associated with an increased risk of small for gestational age and low birthweight infants.

6.5 O PERINATAL POST MORTEM WITHOUT THE BABY: APPLYING ReCoDe CLASSIFICATION FOR PLACENTA EXAMINATION

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Objective:
- To test how "placenta only" examination following perinatal death can contribute to establish the cause of perinatal loss when parents do not consent to post mortem examination.
- To investigate whether ReCoDe system would be applicable to classify outcome of "placenta only" examination.
- To analyse frequency of various forms of placenta pathology in perinatal death in our material.

Method:
Retrospective analysis of 100 random placenta reports from 2013. Reports of full placenta examination (macroscopy and histology) with clinical details were available from 22/40 to 42/40 weeks of gestation of IUD and early NND cases where post mortem examination of the fetus or neonate was not consented. Routine placenta examination and reporting follows a standardised departmental protocol and histology was reported by three experienced perinatal pathologists. Reports were analysed and relevant data entered into a database. To describe placenta pathology 16 diagnostic codes were used. Definition of placenta disease entities was consistent with the Amsterdam classification. (Sampling and Definitions of Placental Lesions Amsterdam Placental Workshop Group Consensus Statement (Arch Pathol Lab Med. 2016;140:698–713) Based on clinical data and pathological findings each case was classified according to the ReCoDe system. Frequency and distribution of relevant placental entities, in particular recurrent lesions was examined and placental cause of death (COD) was considered.

Results: In 64 % placental COD was apparent, in 88 % relevant condition could be identified which could have contributed to the poor outcome, in 28 % lesion with increased recurrence risk was diagnosed. ReCoDe classification was applicable for this group of patients. In Group A, C and F new subcategories could be created for more specificity.

Conclusion In cases when perinatal post mortem examination is not consented, placental examination provides COD in a high percentage of cases and applying ReCoDe classification can provide further insights.

7.1 K INVESTIGATION AND MANAGEMENT OF EARLY ONSET IUGR

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A uniform approach to diagnosis and management of fetal growth restriction (FGR) produces better outcomes, prevents unanticipated stillbirth, and allows appropriate timing of delivery. An estimated fetal weight less than the tenth percentile in association with either an elevated umbilical artery Doppler index, a decreased middle cerebral artery Doppler index, or a decreased cerebroplacental ratio should be considered evidence of FGR. Early-onset and late-onset FGR represent two distinct clinical phenotypes of placental dysfunction.

In early onset disease umbilical artery Doppler abnormalities, documenting a placental perfusion defect, are more common. Progression of umbilical artery Doppler abnormality is the primary determinant of accelerating fetal deterioration, while abnormal ductus venosus Doppler is the primary risk factors for decompensation and abnormal biophysical variables. In the monitoring of the early onset FGR fetus combination of Doppler and cCTG, or biophysical profile provides the best surveillance approach where each testing modality serves as a safety net for the other. Prior to 26 weeks anticipated survival is as low as 35%. Between 26-32 weeks gestation delay of delivery until late ductus venosus Doppler abnormalities or and abnormal cCTG or biophysical profile is observed is associated with the best survival chance and chance for normal neurodevelopmental outcome at age 2.

7.2 O MATERNAL SERUM BIOMARKERS FOR THE PREDICTION OF FETAL AND NEONATAL MORTALITY IN EARLY-ONSET FETAL GROWTH RESTRICTION

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Objective: To identify maternal serum markers that predict poor outcome (fetal or neonatal death) in early-onset fetal growth restriction (FGR)

Methods: Serum samples were collected from women whose fetus had an estimated weight <3rd centile and <600g between 20+0-26+6 weeks' gestation, without a structural, chromosomal, or infective cause. (1) The concentration of 92 cardiovascular-disease-associated proteins was measured using the Olink ProSEEK CVDII multiplex panel; (2) Samples pooled by outcome were immunodepleted, tryptic-digested, tandem mass tagged, and underwent two-dimensional liquid chromatography linked to quantitative tandem mass spectrometry (LC-MS/MS). Five candidate markers from LC-MS/MS, chosen on the basis of fold-change, peptide count, variability and expression pattern clustering, were tested in individual samples using enzyme-linked immunosorbent assays (ELISAs). Data were analysed in STATA using multivariable logistic regression with leave-one-out cross-validation, expressed as Area Under the Receiver Operating Characteristic Curve (AUC).

Results: 63 participants were included, with a median gestational age at recruitment of 23+6 weeks (interquartile range=22+2-25+1) and delivery of 28+2 weeks (interquartile range=26+3-34+0). 21 women (33.3%) had a poor outcome, comprising 16 stillbirths and 5 neonatal deaths. Fourteen multiplex proteins differed significantly by outcome, of which the best predictor was placental growth factor (PlGF, AUC=0.77, 95% confidence interval [CI]=0.65-0.90). Three of the five mass spectrometry candidates maintained an association with outcome when individual samples were analysed: human placental lactogen(HPL=chorionic somatomammotrophin hormone 1, CSH1] (AUC=0.78, 95%CI=0.66-0.91);fibronectin (AUC=0.74, 95%CI=0.59-0.88); pregnancy-specific beta-1-glycoprotein 1 (PSG1, AUC=0.70, 95%CI=0.55-0.86). The best two-variable models contained either HPL, PlGF or PSG1 with either lymphotactin, macrophage receptor MARCO or fibronectin (Table).

Conclusions: At diagnosis of early-onset FGR, maternal serum proteins have a high predictive value for fetal or neonatal death, and provide insights into the pathophysiology of FGR. Following validation, these biomarkers might inform the best counselling and management of these patients and target future potential therapies.

Table: The multivariable models with the highest Area Under the Receiver Operating Curve (AUC) for predicting fetal or neonatal death in severe early-onset Fetal Growth Restriction

		Lymphotactin	Macrophage receptor MARCO	Fibronectin
Human placental lactogen (HPL)	AUC* (95%CI)	0.86 (0.78 to 0.95)	0.85 (0.74 to 0.95)	0.83 (0.72 to 0.94)
	AIC	62.22	61.79	64.98
	VIF	1.01	1.00	1.12
Placental growth Factor (PlGF)	AUC* (95%CI)	0.85 (0.75 to 0.95)	0.84 (0.75 to 0.94	0.81 (0.69 to 0.93)
	AIC	61.59	62.61	67.67
	VIF	1.00	1.00	1.17
Pregnancy-specific beta-1-glycoprotein 1 (PSG1)	AUC* (95%CI)	0.83 (0.73 to 0.93)	0.84 (0.74 to 0.94)	0.86 (0.75 to 0.97)
	AIC	62.94	61.07	61.74
	VIF	1.04	1.09	1.00

95%CI=95% confidence interval, AIC=Akaike Information Criterion, VIF=Variance Inflation Factor. *AUC from leave-one-out cross-validation.

7.3 O A RANDOMIZED CONTROLLED TRIAL AND COST-EFFECTIVENESS ANALYSIS OF LOW DOSE ASPIRIN WITH AN EARLY SCREENING TEST FOR PRE-ECLAMPSIA IN LOW RISK WOMEN – TEST STUDY

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Objective: (i) Determine the feasibility and acceptability of routine daily 75mg aspirin versus screening test indicated aspirin from 11-weeks in low risk nulliparous women; (ii) Assess the cost-effectiveness of a universal aspirin policy compared to screening test indicated aspirin.
Methods: Low-risk nulliparous women were randomised to one of three arms; (i) routine aspirin, (ii) no aspirin, (iii) aspirin based on a positive first trimester Fetal Medicine Foundation pre-eclampsia screening test. In addition to primary outcome measures of the acceptability and feasibility of each approach, a health economic decision analytical model was devised to estimate discounted net health and cost outcomes of each approach.
Results: In terms of acceptability, of 1054 women approached; 546 (51.8%) took part in an RCT involving routine aspirin. Median adherence was 95% amongst the aspirin arm, and 92.3% (489/530) of women asked were willing to take aspirin in a subsequent pregnancy. The feasibility of performing the screening test in the real life setting was limited by the time taken to obtain laboratory analysed PAPP-A and PLGF results; 7.6 (0-26) days. Universal aspirin was the preferred strategy, resulting in the greatest health gain and an overall cost-saving with 9.82 quality-adjusted life-years gained (QALYs) relative to no intervention, while the screen-and-treat policy would achieve 6.50 QALYs. Universal aspirin would result in an estimated cost saving of €16,500 annually relative to no intervention, while screen-and-treat would result in a net increase of €1.45 million.
Conclusion: This is the first multicenter RCT using routine aspirin in low-risk women. In the context of an RCT, low-risk nulliparous women are willing to take aspirin in pregnancy and are compliant. Universal aspirin is an optimal preventative strategy to prevent pre-eclampsia in nulliparous women with the largest health gain and cost saving. A universal aspirin approach for pre-clampsia prevention should be considered.

7.4 O LONGITUDINAL MEASURES OF PLACENTAL DR1 AND R2* IN NORMAL AND FGR PREGNANCIES

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Introduction: Antenatal identification of fetal growth restriction (FGR) as opposed to SGA remains a significant challenge for clinicians. In-vivo measures of placental oxygenation may aid identification. Oxygen-Enhanced (OE) MRI can measure changes in placental pO_2 (dR_1). Cross-sectional studies have demonstrated a strong negative correlation between pO_2 and gestation, with a lower pO_2 in FGR pregnancies. Our aim was to determine if this gestational decline in placental pO_2 was observed longitudinally, and whether the rate of decline differed between normal and FGR pregnancies.
Methods: 38 women were recruited from St Mary's Hospital, Manchester. 16 women with normal pregnancies (IBR>20th centile) and 8 with FGR pregnancies (IBR<5th centile) completed two placental MRI scans. Placental pO_2 changes were quantified with a hyperoxic challenge OE-MRI sequence, baseline R_2* were also obtained. Analysis was performed by mixed level linear regression (STATA 13).
Results: 14 of 38 women had a single scan due to iatrogenic preterm delivery or maternal choice.
FGR pregnancies had a significantly shorter scan interval (median days(range) FGR vs. Normal) 25.5(8-78) vs. 34.5(24-93)(p=0.03), delivery gestation 230(180-274) vs. 276(257-291) and birthweight centile 0(0-2.2) vs. 59(28-89)(both p<0.0001). There was a negative association of dR_1 with gestation (entire cohort p<0.0001). FGR placentas had a significantly lower dR1 following adjustment for gestation (p=0.03) and a trend towards a different gestational decline (p=0.08). Baseline R_2* positively correlated with gestation (entire cohort p<0.0001). Longitudinal R_2* values were not significantly different between FGR and normal placentas (p=0.17), but there was a difference in the incline over gestation (p=0.02).
Conclusions: This is the first demonstration of a negative association of placental pO_2 with gestation within pregnancy; however longitudinal measures offer no additional benefit over a single MR scan in the identification of FGR, particularly as the time interval necessary to show differences within pregnancy is not clinically feasible or well tolerated.

8.1 K INVESTIGATION AND MANAGEMENT OF LATE ONSET IUGR

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Fetal growth restriction (FGR) presents under two overlapping clinical phenotypes, mainly determined by the gestational age at onset. By consensus late FGR is that diagnosed >32 weeks. First- or second-trimester screening strategies do not provide good prediction for late FGR, in which the association with preeclampsia is weak. In low risk pregnancies, third-trimester serial fundal height measurements continues to be the only physical examination screening test available, although with limited detection capacity. Third-trimester selective scan based on maternal risk factors misses most instances of late FGR. Universal screening by ultrasound improves the detection rate, although there is no good evidence that routine scan improves perinatal outcomes.

Once a fetus is found small, the distinction between late FGR versus SGA is relevant because of the correlation with perinatal outcome. Whereas high-risk FGR represents a pathological condition associated with adverse perinatal outcome, low-risk SGA babies have perinatal outcomes similar to the normally grown. As opposed to early-FGR, late FGR is not well captured by the umbilical artery Doppler. A combination of biometrical parameters (with severe smallness usually defined as <3rd centile) with Doppler criteria of placental insufficiency (either in the maternal [uterine Doppler] or fetal [cerebroplacental ratio] compartments) offers a classification tool which correlates with the risk for adverse outcomes. For surveillance, ultrasound growth assessment should not be performed more frequently than every 2 weeks because the inherent error associated with ultrasonographic measurements. Among the Doppler parameter, the cerebroplacental ratio (which combines the pulsatility index of the middle cerebral and umbilical artery) becomes abnormal during the follow-up in a substantial fraction of cases; and because it has a reasonable predictive performance for adverse outcome is the primary surveillance tool in late-FGR. While induction of high-risk FGR pregnancies at 37-38 weeks is clearly justified, a more expectant management with close follow-up could be offered to low-risk SGA.

8.2 O LOW PlGF AND ULTRASOUND DEFINED FETAL GROWTH RESTRICTION IN LATE-ONSET SMALL-FOR-GESTATIONAL-AGE PREGNANCIES.

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Objectives: In a cohort of small-for-gestational-age (SGA) pregnancies without hypertensive disease, to assess whether low maternal PlGF at diagnosis of SGA identifies the same fetuses subsequently classified as growth restricted (FGR) by detailed Doppler studies, and to investigate the relationship between low PlGF and adverse pregnancy outcomes.
Methods: We utilised an historical database of SGA pregnancies (fetal abdominal circumference <10th percentile) ≥32 weeks' gestation from Auckland, New Zealand 1993-1997. At SGA diagnosis, pregnancies with either umbilical artery resistance index (RI) >95th centile or estimated fetal weight (EFW) <3rd customised centile fulfilled 'initial FGR' criteria. The ability of low PlGF (<5th%ile) at SGA diagnosis to identify 'secondary FGR' (internal carotid RI <10th centile, cerebro-placental ratio <1 and/or mean uterine artery RI >95th centile) was calculated. Within the full cohort, adverse perinatal outcomes (operative delivery for fetal distress and/or birth asphyxia) and later hypertensive disease were compared between low and normal PlGF.
Results: Of 136 SGA pregnancies, 56 (41.1%) had initial FGR. Of the remaining 80 cases, 20 (25.0%) had secondary FGR, and 17 (21.3%) had low PlGF. The sensitivity of low PlGF identifying secondary FGR was 0.30 (95% CI 0.14-0.50), specificity 0.83 (0.70-0.92), positive predictive value 0.47 (0.23-0.72) and negative predictive value 0.70 (0.57-0.81). In the full cohort, low PlGF occurred in 44/136 (32.4%) pregnancies and was associated with subsequent gestational hypertensive disease (63.6% *cf* 15.2%, *p*<0.01), adverse perinatal outcome (34.1% *cf* 15.2%, p=0.01) and smaller infants (customised centile 2.2 *cf* 6.8, p<0.01), with 65.9% of infants <3rd centile.
Conclusions: In late-onset SGA, low PlGF at SGA diagnosis performed poorly at identifying infants classified FGR by detailed Doppler studies. However, low PlGF was associated with high risk of adverse perinatal outcome and very low birthweight. The association between low PlGF and subsequent gestational hypertensive disease may be of clinical utility

8.3 O LONGITUDINAL GROWTH ASSESSMENT FOR THE PREDICTION OF ADVERSE PERINATAL OUTCOME AMONG SGA-SUSPECTED FETUSES

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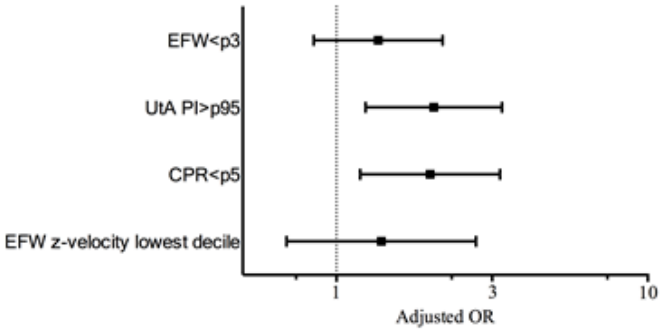
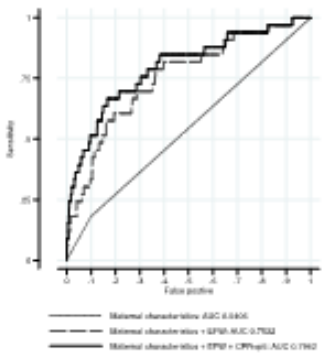
Objectives: To establish whether the use of growth velocity adds to Doppler evaluation in predicting APO among SGA-suspected fetuses.
Methods: A prospective cohort of consecutive singleton pregnancies with late (diagnosis>32 weeks) SGA (estimated fetal weight < 10th centile) was created. Longitudinal growth assessment was performed by the calculation of z-velocity between US at diagnosis and last US before delivery. The improvement in association and predictive performance for APO of EFW z-velocity was compared against standard criteria of FGR evaluated before delivery (EFW<3rd centile, abnormal uterine Doppler or abnormal cerebroplacental ratio).
Result: A total of 472 patients were prospectively evaluated for suspected SGA. Of them, 231 (48.9%) qualified as late FGR. Univariated analysis showed a significant trend towards higher frequency of EFW z-velocity in lowest decile in pregnancies with APO (14.5% vs. 80.2%; p=0.041). Nonetheless, the addition of z-velocity neither improved the association nor the prediction performance of standard criteria of FGR for the occurrence of APO.
Conclusions: Longitudinal assessment of fetal growth by means of z-velocity does not add to Doppler criteria in predicting adverse perinatal outcome in SGA-suspected fetuses.



8.4 O ADDED VALUE OF CEREBRO-PLACENTAL RATIO AT ROUTINE THIRD TRIMESTER SCREENING AS A PREDICTOR OF SGA AND FGR IN NON-SELECTED PREGNANCIES

Rial Crestelo, M; Martinez-Portilla, RJ; Cancemi, A; Peguero A; Caradeaux J; Gratacos E; Francesc Figueras
Fetal i+D Fetal Medicine Research Centre, BCNatal - Barcelona Centre for Maternal-Fetal and Neonatal Medicine (Hospital Clínic and Hospital Sant Joan de Deu), IDIBAPS, University of Barcelona, Spain.

Objectives: To determine the value of cerebroplacental ratio (CPR) at third trimester scan in an unselected obstetric population to predict low birthweight.
Methods: We constructed a prospective cohort study of women with singleton pregnancies attending the fetal medicine department at Hospital Clinic of Barcelona between January 2016 and December 2016 for routine third trimester screening (32-34+6 weeks). Fetal biometry and prenatal fetal and maternal Doppler ultrasound examinations were performed by certified sonographers. The CPR was calculated as a ratio of the MCA PI divided by the UA PI, and it was considered abnormal if <5th centile. Both obstetricians and patients were blinded to the results, except in cases of estimated fetal weight < p10. The association between third trimester CPR and SGA, FGR and adverse perinatal outcome was assessed by logistic regression, where the basal comparison was a model comparing maternal characteristics and EFW.
Results: A total of 1,048 women were included. Of them, 17 were excluded because: lost to follow-up (n=12); congenital malformations (n=4); and drug consumption (n=1), leaving 1,014 pregnancies for analysis. The mean gestational age at scan was 33 weeks of gestation. In addition to maternal characteristics, both EFW and CPR were significantly associated with SGA and FGR. Both FGR and SGA full models including maternal characteristics, EFW and CPR significantly improved the explained uncertainty (R^2) compared to maternal characteristics alone. However, the addition of CPR to maternal characteristics and EFW only marginally improved the AUC for SGA (0.793; p=0.33) and FGR (0.796; p=0.08).
Conclusions: The added value of CPR at 33 weeks of gestation for detecting fetal growth restriction is poor.



8.5 O BIRTH WEIGHT DIFFERENCES AT TERM ARE EXPLAINED BY THE GENDER, GESTATIONAL AGE, AND PLACENTAL DYSFUNCTION, BUT NOT BY ETHNICITY

José Morales-Roselló[1] MD, Tiran Dias[2]MD, Asma Khalil[3] MD, Victoria Fornes-Ferrer[4], Ricardo Ciammella[1], Laura Gimenez Roca[1], Alfredo Perales-Marín[1] MD, Thilaganathan Basky[3] MD.
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Objective: To investigate the association between birthweight (BW) and ethnicity, fetal sex and placental dysfunction in a mixed population of term fetuses from south Asian and Caucasian origins.
Methods: This was a retrospective study of 627 term fetuses attending the maternities of two public tertiary hospitals in Spain and Sri Lanka. All fetuses underwent a scan and Doppler examination within two weeks of delivery. Gestational age (GA) at birth, cerebroplacental ratio (CPR), fetal sex, ethnicity, maternal height, weight and parity, were selected in a multivariate regression analysis to evaluate which parameters explained differences in BW.
Results: Sri Lankan fetuses were smaller than the Spanish ones (BW mean =3026.5 g ±448.78 versus 3295.3 g ±444.28, p<0.001). However, multivariate regression analysis indicated that this difference was not explained by ethnicity (estimate 0.008, p=0.859) but by GA at delivery, CPR and fetal sex (estimates 0.163, p<0.001; 0.092, p=0.001 and 0.082, p=0.01). The influence of maternal height and weight on BW was minimal in comparison (estimates: 0.009, p=0.002 and 0.006, p<0.001).

	Estimate	95% Confidence interval	P-value
(Intercept)	-5.437	[-7.053, -3.821]	
GA at delivery	0.163	[0.128, 0.197]	<0.001
CPR	0.092	[0.037, 0.147]	0.001
Fetal gender (male)	0.082	[0.02, 0.143]	0.01
Maternal height	0.009	[0.003, 0.014]	0.002
Maternal weight	0.006	[0.003, 0.009]	<0.001
Maternal age	0.004	[-0.001, 0.01]	0.138
Parity	0.035	[-0.004, 0.074]	0.08
Ethnicity (Sri Lankan)	0.008	[-0.084, 0.101]	0.859
Interval exam-delivery	0.006	[-0.001, 0.012]	0.083

Conclusions: Fetal birthweight variation at term is less dependent on ethnic origin. Multivariate regression linear analysis of the studied parameters Only those parameters usually included in customized models plus the cerebroplacental ratio (CPR), as well as the gestational age (GA) at delivery were analyzed.

8.6 O PREVENTING THIRD-TRIMESTER STILLBIRTHS BY IMPROVING DETECTION OF FETAL GROWTH RESTRICTION: A POPULATION-BASED NESTED CASE-CONTROL STUDY IN FRANCE

Anne Ego, Jennifer Zeitlin
Grenoble Alpes Hospital, FRANCE

Objective: We assessed the impact of detection of fetal growth restriction (FGR) on third trimester stillbirth risk among singleton small for gestational age (SGA) fetuses and the margin for stillbirth prevention associated with better antenatal detection.
Method: The REPERE study is a case-control study nested within a population-based stillbirth register in 3 French districts (≈30 000 births annually). Cases were singleton, SGA (birthweight (BW) <10th percentile of customised growth references) stillbirths at ≥28weeks of GA from 2012 to 2014. Controls were live births fulfilling the same criteria over 3 months in 2014. Trained midwives abstracted data from medical records and ultrasound reports. Detection was defined as at least 1 of the following: mention in medical records of FGR or growth faltering, abdominal circumference or estimated fetal weight <10th percentile, additional ultrasounds to monitor growth, or abnormal Doppler values.
Results: Out of 92.000 total births, the stillbirth rate at 22 weeks of gestation and over was 7.3 per 1000 births; after removing multiples, gestations less than 28 weeks, severe congenital anomalies and AGA fetuses, 47 cases were included, representing a stillbirth rate of 0.5‰. Among cases, 38.3% (18/47) were detected, compared with 36.0% of controls (153/425 inclusions) or an unadjusted odds ratio (OR) of 1.1 (95%CI: 0.6-2.1). Cases were more severely growth restricted and had more obstetrical risk factors than controls. After adjusting for BW percentile and obstetrical history, the OR associated with detection was 0.5 (95% CI: 0.3-1.0). We estimated that improving FGR screening to achieve 100% detection of SGA fetuses would decrease the stillbirth rate by 0.16 per 1000 births (15 stillbirths out of 92.000 births).
Conclusions: Our study suggests that detection of FGR may halve stillbirth risks for SGA fetuses; however, the potential effect of this prevention strategy on the overall stillbirth rate is modest.

11.1 K DICHORIONIC TWIN TRAJECTORIES: THE NICHD FETAL GROWTH STUDIES

Katherine Laughon Grantz, M.D., M.S
Investigator, Epidemiology Branch, Division of Intramural Population Health Research. NICHD, USA

Systematic evaluation and estimation of growth trajectories in twins require ultrasound measurements across gestation, performed in controlled clinical settings. Until recently, there were few such data for contemporary populations. This presentation will review findings from the NICHD Fetal Growth Studies – Twins whose objective was to empirically define the trajectory of fetal growth in dichorionic twins and to compare the fetal growth trajectories for dichorionic twins with those based on a growth standard developed by our group for singletons.

A prospective cohort of 171 women with twin gestations was recruited from eight U.S. sites from 2012 to 2013. After an initial sonogram at 11w0d-13w6d where dichorionicity was confirmed, women were randomized to one of two serial ultrasonology schedules and underwent a median of 5 ultrasounds. Growth curves and percentiles were estimated, and percentiles were compared statistically at each gestational week between the twins and 1,731 singletons, after adjustment for demographic characteristics. Singleton standards were weighted to correspond to the distribution of maternal race in twins. For those ultrasound measurements where there were significant global tests for differences between twins and singletons, week-specific differences were tested at each gestational age. In a separate analysis, the degree of reclassification in small-for-gestational-age (SGA), defined as below the 10^{th} percentile, that would be introduced if fetal growth estimation for twins was based upon an unweighted singleton standard was evaluated. The 50^{th} percentile abdominal circumference and estimated fetal weight trajectories of twin fetuses diverged significantly beginning at 32 weeks. There were no differences in head circumference or femur length. The mean head circumference/abdominal circumference ratio was progressively larger for twins compared with singletons beginning at 33 weeks, indicating a comparatively asymmetric growth pattern. At 35 weeks, the estimated fetal weights for the 10^{th}, 50^{th} and 90^{th} percentiles were 1960, 2376, and 2879 g for dichorionic twins and 2180, 2567, and 3022 g for the singletons. At 32 weeks, the initial week when the mean estimated fetal weight for twins was smaller than that of singletons, 34% of twins would be classified as small for gestational age using a singleton, non-Hispanic white standard. By 35 weeks, 38% of twins would be classified as small for gestational age.

In summary, the comparatively asymmetric growth pattern in twin gestations, initially evident at 32 weeks, is consistent with the concept that the intrauterine environment becomes constrained in its ability to sustain growth in twin fetuses. Given the high percentage of twins that are classified as SGA using a singleton non-Hispanic white standard, it could be argued that our findings indicate the need for an ultrasound reference that is specific for twins. However, the clinical challenge is to differentiate SGA associated with the normal adaptive process in multiple gestations from fetal growth restriction that is associated with increased morbidity and mortality. Future studies with long term follow up are needed to determine whether dichorionic twin fetuses in otherwise uncomplicated pregnancies that are classified as SGA using a singleton standard are at increased risk for short or long-term morbidity.

11.2 O TWIN GROWTH AND LATE ONSET IUGR

Jason Gardosi, Andre Francis
Perinatal Institute, Birmingham, UK

Twin pregnancies have many increased risks of adverse outcome for mother and baby. Fetal growth restriction is a major and frequent complication in dichorionic as well as monochorionic pregnancies, and appropriate monitoring of growth is a particular challenge. Recent renewed interest in fetal growth in twins has led to development of growth curves based on longitudinal fetal biometry studies in dichorionic and monochorionic twin pregnancies. Several studies have reported curves that followed those of the singleton curve up to 30-32 weeks, after which growth slowed.

The question arises whether this slower growth is a physiological adaptation, representing 'normal', or a pathological consequence of multiple pregnancies, manifesting by late onset fetal growth restriction - as also evidenced in singleton pregnancies, but more likely to occur due to environmental constrains. Unlike early onset growth restriction, late onset is characterised by *relative* placental insufficiency, is more insidious and is often not detected antenatally. Growth restriction is also not easily recognised postnatally, as we have no gold standard to assess whether a fetus' growth potential has been reached.

Such unrecognised growth restriction may be contributing to a downward shift of the reference curve, and acceptance of such a curve as standard may normalise a pathological effect and reduce recognition of babies at risk. It is advisable therefore to tread with caution when considering adopting new charts for twin pregnancies. Whether third trimester growth tailing off can be considered normal, or instead represents frequent pathological occurrence with mostly normal outcome is a question yet to be answered. Preliminary work will be presented which seeks to identify and exclude hidden pathology through the epidemiological definition of a 'supernormal' standard.

11.3 O CROSS-SECTIONAL VERSUS LONGITUDINAL ASSESSMENT OF ABDOMINAL CIRCUMFERENCE AND ESTIMATED FETAL WEIGHT IN THE DETECTION OF MACROSOMIA

Tri Rahmat BASUKI, Javier CARADEUX, Elisenda EIXARCH, Eduard GRATACOS, Francesc FIGUERAS
Fetal i+D Fetal Medicine Research Center, BCNatal - Barcelona Center for Maternal-Fetal and Neonatal Medicine (Hospital Clínic and Hospital Sant Joan de Deu), IDIBAPS, University of Barcelona, Spain; and Centre for Biomedical Research on Rare Diseases (CIBER-ER), Spain.

Objective: To determine in unselected singleton pregnancies whether longitudinal growth assessment adds over cross-sectional evaluation in the prediction of macrosomia and largeness-for-gestational age (LGA).
Methods: A cohort of 946 unselected singletons pregnancies scanned at 32±2 and 37±1 weeks was created. Longitudinal estimated fetal weight (EFW) and abdominal circumference (AC) growth were assessed by conditional centile calculation. The longitudinal assessment was compared to cross-sectional assessment at 37±1 weeks for the prediction of macrosomia (>4000 g) and LGA (>95th customized centile). ROC curve analysis was performed and areas under the curve (AUC) were compared among parameters.
Results: A total of 60 (6.3 %) babies qualified for macrosomia and 40 (4.2 %) for customized LGA. Compared to 37-week EFW centile as a reference (AUC 0.81; 95% CI 0.74-0.87), both the conditional AC (AUC 0.67; 95% CI 0.59-0.74) [p<0.001] and the conditional EFW (AUC 0.67; 95% CI 0.58-0.75) [p<0.01] showed lower AUCs for the prediction of macrosomia. Similarly, for the prediction of LGA, compared to 37-week EFW centile as a reference (AUC 0.83; 95% CI 0.74-0.91) both the conditional AC (AUC 0.71; 95% CI 0.61-0.8) [p<0.01] and the conditional EFW (AUC 0.7; 95% CI 0.59-0.8) [p<0.01] showed lower AUCs.
Conclusions: Longitudinal evaluation of fetal growth between 32 and 37 weeks does not add predictive value for macrosomia or LGA over cross-sectional evaluation at 37 weeks.

11.4 O PREDICTED FETAL MACROSOMIA ON SCAN - INTERVENTION RATES POST MONTGOMERY RULING

K Cresswell, M Malina, D Janga
North Middlesex University Hospital, London, UK

Objectives: To evaluate the various patient characteristics and factors surrounding the diagnosis of macrosomia and subsequent management of pregnancy. The aim of our review was to identify the factors which influence the management of pregnant women after an ultrasound scan report predicting a big baby and to improve the quality of care we provide at our unit.
Methods: This is a retrospective audit covering a period of 1 year (January 2016 to December 2016) in a busy inner London District General Hospital, catering to a multi-ethnic diverse population. We reviewed 50 sets of case notes and collected the data. Women who delivered in our maternity unit with ultrasound scan in third trimester showing AC (abdominal circumference) or EFW (Estimated Fetal Weight) >95th centile were included.
Results: We reviewed case notes for 50 pregnant women who met our scan criteria. The age ranged 20-42yrs, with a median 30 yrs. The birth weight of babies ranged between 3235-5170g, median 3840g. The median gestational age at delivery was 36+5 weeks. Rate of induction of labour (IOL) based on the scan was 16% and 87.5% of this group had a successful vaginal delivery. The mode of delivery in the group was; vaginal delivery (44%), elective CS (26%) and emergency CS (30%). Interestingly 6 out of 13 (46.15%) of elective CS was for maternal request for big baby.
Conclusions: With increasing awareness amongst the staff about the Montgomery case and counselling women regarding the risks of shoulder dystocia, we noticed an increase in elective CS for suspected fetal macrosomia. The IOL rates did not increase at a similar rate and there was no shoulder dytocia in this cohort. We conclude use of customised charts and adequate counselling may avoid further increase in operative intervention rates.

12.1 K OVERVIEW OF INTERNATIONAL GUIDELINES- AREAS OF CONSENSUS AND CONTROVERSY

Professor Lesley McCowan
University of Auckland, Auckland New Zealand

Objective: To summarise consensus and controversy between recently published National Guidelines on SGA or FGR.
Method: Six Guidelines were identified published after 2010.
Results There is agreement between guidelines (≥4/6) about risk selection, and use of low dose aspirin for women with major risk factors. All recommend fundal height should be measured in the third trimester, three recommend a customized growth chart, and two McDonald's rule. Routine third trimester scanning is not currently recommended (5/6). Umbilical artery Doppler is universally advised in suspected SGA. There inconsistency in the recommended frequency for scans after diagnosis of SGA/FGR (2-4 weekly). In late onset FGR (≥32 weeks) general consensus is to use cerebral Doppler studies to assist with management decisions; fetal surveillance and recommended timing of delivery vary. There is universal agreement that corticosteroids should be administered before birth at <34 weeks, and general consensus on the use of magnesium sulphate for neuroprotection in early onset FGR <32 weeks. Most recommend using CTG to time delivery in FGR <32 weeks. Gestation at delivery for FGR with absent and reversed end-diastolic velocity varies - 32 to ≥34 weeks and 30 to ≥34 weeks respectively.
Conclusions: Further convergence between guidelines is possible by incorporation of existing RCT evidence. The utility of late third trimester ultrasound to prevent morbidity/mortality is a research priority, requiring very large sample size. Prospective studies are needed to compare new international population ultrasound standards with those in current use.

12.2 K PROTOCOLS DEVELOPED IN 'PERINATAL IRELAND'

Alyson Hunter
Belfast Health and Social Care Trust

Perinatal Ireland is a research collaboration between 7 of Ireland's largest maternity units - Dublin (Rotunda, Coombe and National Maternity Hospitals), Cork, Limerick, Galway, Drogheda and Belfast. Published research studies include the ESPRIT twin study, the PORTO Fetal Growth study and GENESIS (head circumference at term and birth outcome). This talk will discuss the advantages of working in such collaborative research settings and how our results have helped shaped practice and led to the development of clinically used Guidelines.

Poster – Oral 1 (Session 3)

3.1 PO QUILTING TO QUIT SMOKING IN PREGNANCY: A FEASIBILITY STUDY.

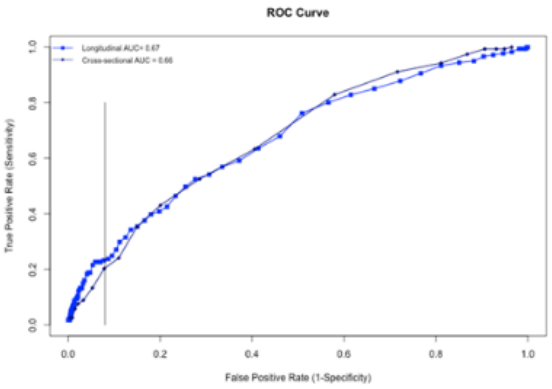
Helen Baston, Natalie Khoaz, Sarah Senbeto, Jane Grice
Sheffield Teaching Hospital NHS Foundation Trust, England

Objective: to investigate whether the Quilt to Quit (Q2Q) is a feasible and acceptable intervention to support pregnant women who wish to stop smoking
Method: This was a mixed method feasibility study of 50 women who were known to be smoking during their pregnancy and who expressed a desire to stop smoking using support from a dedicated team of stop smoking specialist midwives (SSSMWs). It study was funded by Small Grants Scheme (Webster Legacy, Jessop Wing)
The usual care pathway is routine carbon monoxide screening at every antenatal contact, identification of the source of exposure and offer one to one support (behavioural and/or pharmacological) from SSSMWs to all smokers. Ethical approval was gained to approach women to take part in the Q2Q intervention and to invite a sample of women and the SSSMWs to respective focus groups. Following consent, women received usual care as above and in addition were given a starter pack including everything they needed to start quilting, shown how to use it and asked to complete a questionnaire to assess level of addiction, competence as a sewer and readiness to quit. A follow up questionnaire evaluated compliance and experiences.
Results: Of the n=111 women approached to take part, n=50 consented and n=33 completed both questionnaires. Most women who took part found it 'relaxing' and 'enjoyable' with the least chosen options being 'difficult' or 'confusing'. Negative feedback regarding the use of questionnaires was noted. The intervention was generally well received with some women feeling it had made a positive contribution to their quit attempt. Midwives enjoyed having another option to drugs, to offer women.
Conclusions: The intervention was feasible to recruit to and acceptable to women and midwives. Important lessons were learned regarding the barriers assessment tools can pose when aiming to engage women and midwives in research.

3.2 PO CAN LONGITUDINAL FUNDAL HEIGHT PREDICT SMALL-FOR-GESTATIONAL AGE WITH IMPROVED ACCURACY OVER CROSS-SECTIONAL MEASURES?

Sarah Pugh, Ana Ortega-Villa, Roger Newman, John Owen, Deborah Wing, William Grobman, Paul Albert, Katherine Grantz
Eunice Kennedy Shriver NICHD, U.S.A.

Objective: Individual fundal heights (FH) are used clinically to screen pregnancies for small-for-gestational age (SGA), but their predictive value for SGA at birth is poor. Our study objective was to investigate whether longitudinal measures of FH improved SGA prediction.
Methods: In a prospective observational study of 2334 non-obese, low-risk pregnant women across four racial/ethnic groups, from 12 U.S. sites, gestational age (GA) was assigned based on last menstrual period confirmed by 1st-trimester ultrasound. FH was measured blindly by research personnel at 6 study visits and additional measures were abstracted from medical charts. SGA was defined as <10th percentile for birthweight (Duryea)). A two-stage model (Albert, Statistics in Medicine, 2012) was used to predict SGA from longitudinal measures of FH until visit 3 (mean GA 32.0 ± 1.5 weeks). Specifically, a linear mixed model was used to estimate slopes and intercepts characterizing individual trajectories in the first phase, and these quantities were used in a logistic regression as covariates to predict SGA in a second phase. We compared longitudinal FH prediction with cross-sectional FH assessment by constructing ROC curves for a range of cut-off values based on the difference between FH and GA at visit 3 to classify SGA.



Results: Longitudinal FH measurements more accurately classified SGA newborns than cross-sectional FH, as evidenced by an improvement in the area under the curve from 0.66 to 0.67. When the cross-sectional cut-off value was ≤ -3cm, a commonly used clinical cut-off for the difference between FH and GA, the sensitivity and specificity for SGA were 20% and 92%. At a comparable specificity of 92%, the longitudinal prediction method was slightly more sensitive to SGA (23%).
Conclusion: Incorporating repeated measures of FH slightly improves SGA prediction accuracy over cross-sectional measures; however, FH remains a poor predictor of SGA.

3.3 PO DOES DETECTION OF SGA CHANGE NEONATAL OUTCOME – RETROSPECTIVE COHORT STUDY

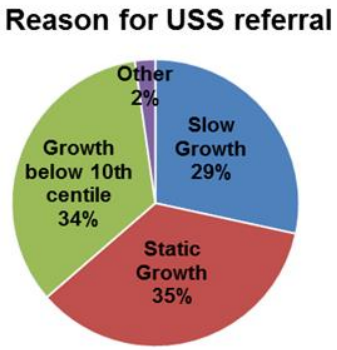
Anna Kajdy, Jan Modzelewski, Monika Jakubiak, Artur Pokropek
Żelazna Medical Center, Warsaw, Poland. Institute of Philosophy and Sociology Polish Academy of Sciences Warsaw, Poland

Objective: Fetal growth restriction (FGR) is antenatal detection of fetus <10 centile or fetal weight for given week of pregnancy. It could be a sign of serious fetal compromise. On the other hand, because of large discrepancy between ultrasound estimated fetal weight and real fetal weight probably some of FGR diagnosed neonates are healthy. On the other hand in low risk populations, antenatal detection is quoted as less then 15%. We previously audited the detection rate of FGR in our centre and it was 35% (unpublished data). We wanted to reassess the detection rate in the aspect of its effect on neonatal outcome in our centre.
Methods: Through our hospital's computer database we analysed all singleton neonates born between 2010 and 2016 in our tertiary referral hospital and created our own growth chart for the need of this study. Then we compared the findings with the WHO antenatal growth charts. In that way we identified neonates <10 th percentile. Those neonates were checked for antenatal diagnosis of SGA, perinatal and neonatal outcome.
Results: 39075 singleton deliveries took place in our centre. We found that perinatal diagnosis of SGA is associated with more severe neonatal outcome, probably due to antenatal detection of the most severe cases. Neonates who where <10th percentile according to population growth charts but were not diagnosed as SGA antenatally had a higher risk of neonatal complications compared to healthy neonates, but better than those with perinatal SGA diagnosis.
Conclusions: Antenatal ultrasound screening may identify those of greater risk of unfavourable neonatal outcome.

3.4 PO ESTABLISHING A MIDWIFE-LED FETAL GROWTH ASSESSMENT (MFGA) CLINIC FOR LOW RISK WOMEN TO DETECT FETAL GROWTH RESTRICTION

Heather Watson, Helen Rice, Phyl Gargan, Pat Whitley, Brenda Kelly, Mary McCormack & Colette Gordon
Royal-Jubilee Maternity Service and Mater Maternity Belfast Health and Social Care Trust, Northern Ireland

Background: Surveillance of fetal growth in the third trimester of pregnancy using regular fundal height measurement, ultrasound (USS) biometry or a combination of both methods continues to be the mainstay for the assessment of fetal wellbeing [1]. If the fundal height measurement suggests fetal growth restriction (FGR), protocols prompt referral for USS to determine the estimated fetal weight [2]. Thus the overall performance of a growth screening programme, in terms of the proportion of FGR babies who are detected antenatally, depends on adequate resources for third trimester USS which are not always easily accessible [1].
Method: In the past, arranging a third trimester USS was very difficult for community midwives, who are often the lead professional for low risk women receiving antenatal care, as the hospital antenatal clinics were often busy and already at full capacity. After a detailed planning phase, the Midwife-Led Fetal Growth Assessment (MFGA) Clinic was set up in February 2017 to provide USS for low risk women attending Midwife-Led Care (MLC) where there was a suspicion of FGR following a fundal height measurement. The MFGA clinic is a direct referral service for midwives to refer into and over a 4 month period, the clinic had received 88 referrals from community midwives across the Trust (see Chart 1 for details).
Findings: The findings of the USS performed were: 86% (n=76) of USS were normal and the women were referred back to MLC, 9% (n=8) women required serial USS; Other, 5% (n=4). For those women who were referred for serial USS (n=8), preliminary results indicate that of the babies born so far 83% (n=5) had FGR detected and were appropriately monitored for the duration of the pregnancy.



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[2] Gardosi J, Giddings S, Clifford S, et al 2013. Association between reduced stillbirth rates in England and regional uptake of accreditation training in customised fetal growth assessment. BMJ Open (3),e003942.

3.5 PO AUDIT FOR MISSED SMALL FOR GESTATIONAL AGE BABIES

Priti Wuppalapati (SAS doctor) Natalie Hayes (Midwife), Farhat Iqbal (ST7), Neeraja Singh (Consultant)
Bolton NHS Foundation Trust, United Kingdom

Objective: An audit was undertaken to look at small for gestational age (SGA) babies born at Bolton Foundation Trust, which were not detected in the antenatal period.
Aim: The aim of the audit was to identify any patterns in why these SGA babies were undetected, if local and national policies were being followed, overall outcomes, the areas for improvement and to plan for the future care.
Methodology: The audit was a retrospective audit, looking at 50 cases in a six month period. The hospital notes were requested for all women who had had babies in that period, born with a birth weight centile of ≤5. Out of the 50 cases, 43 sets of notes were allocated and a set criteria was used to look at every case. The group was divided into two, ≤ 2 centile and 2.1-5th centile
Conclusion: The conclusion was quite clear from the audit. Scan capacity plays a major factor in why the recommended guidance wasn't followed. As a trust we do not perform serial scans for all the major risk factors (as per RCOG), eg smoking and BMI >35, and many of the missed cases had one or both of these risk factors. Training was also an issue, initial face to face training was rolled out throughout the trust from 2015, however this was said to be a one off training. It is evident that an update is needed regularly and from the results of this audit a robust plan has been derived to tackle the said problems

3.6 PO CUSTOMISED GROWTH CHARTS – EFFECTS ON OUTCOMES IN A LARGE TEACHING HOSPITAL.

Brian Dromey, Jonathan Nelson, Thomas Everett, Kelly Cohen. Leeds Teaching Hospitals NHS Trust, UK

Objectives: To assess the clinical utility of customised growth charts for the detection of the SGA fetus, the effect on antenatal intervention rates and birth outcomes.
Method: In 2015 The Leeds Teaching Hospitals Trust implemented Customised Growth Charts (GROW-Chart) into routine practice. The intrapartum records and neonatal outcomes are recorded in an electronic patient record (K2 Systems). Between August 2016 and January 2017, data from the GROW App was entered into the SABINE database, as part of the Saving Babies in the North of England project. A birthweight centile was generated for each singleton born in this period. Ante-natal scan data and ante-natal suspicion of SGA were also recorded. These data were matched and merged by NHS number.
Results: 5837 babies were born during this period. During this time there were 26 stillbirths. 582 were confirmed as being <10th centile by birthweight, of these babies 29% were identified by antenatal ultrasound, following concern on a CGC. 105 babies (18% of SFGA) were correctly identified clinically, without scanning. 53% of SGA babies were undetected prior to birth. 748 women (12% of the total population) had a risk factor for SGA, were scanned but had birthweights above the 10th centile. There were no differences detected in mode of delivery, between babies who were suspected to be small and the low risk population. The monitored group had a higher rate of induction (41%, Vs 37%). There were no differences in admission to neonatal unit or cord gases for babies above or below the 10th centile.

Mode of Delivery Jul-Jan

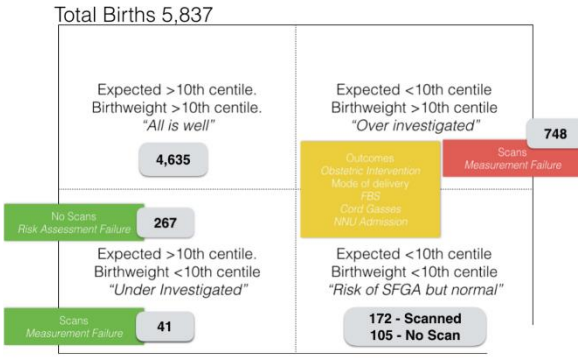
Mode of Delivery	Total Population		MONITORED GROUP *"Risk of SGA"*		<10TH CENTILE *(by Birthweight)*	
	NUMBER	%	NUMBER	%	NUMBER	%
BREECH VAGINAL	38	**0.6**	8	**0.7**	4	**2.34**
CAESAREAN SECTION	1277	**21.9**	252	**21.2**	49	**28.65**
FORCEPS	661	**11.3**	116	**9.7**	9	**5.26**
SVD	3711	**63.5**	782	**65.7**	99	**57.89**
VENTOUSE	149	**2.6**	32	**2.67**	5	**2.92**
TOTAL	5836		1329		171	

Conclusions: The introduction of customised growth charts at Leeds Teaching Hospitals has resulted in an SGA detection rate of 49%, similar to the previous detection rate with no apparent reduction in stillbirth rate. There were no differences in neonatal outcomes, despite a large increase in antenatal scanning.

3.7 PO CUSTOMISED GROWTH CHARTS IN CLINICAL PRACTICE - INTRAPARTUM & POSTNATAL OUTCOMES FOR MONITORED AND UNMONITORED GROUPS.

Brian Dromey, Jonathan Nelson, Thomas Everett, Kelly Cohen. Leeds Teaching Hospitals NHS Trust, UK

Objectives: - To compare the outcome data for a "High Risk of Growth Restriction" group, the wider population and birthweight less than the 10th centile on a customised growth chart.
Method: The Leeds teaching hospitals has implemented a nationally recognised Customised Growth Chart (GROW-Chart) in ante-natal care. Once delivered the baby's birthweight is imputed into the GROW-APP and the birth centile calculated. Details of ante-natal suspicions or investigations for suspected growth restriction are also inputted. The intrapartum records and neonatal outcomes are recorded in an electronic patient record (K2 Systems). Both sets of data were linked by NHS number. Data from GROW-App, Intrapartum and Postpartum were matched and merged by NHS number. These data were recorded for a 6 month period, between August 2016 and January 2017. The total number of deliveries was 5,837.
Results: 1329 babies were monitored ante-natally. 582 were identified as being <10th centile by birthweight. 282 (48% of SFGA) had no identified risk factors and were not scanned
748 (12% of the total population) had an risk factor, were scanned but had birthweights above the 10th centile.
Rates of Induction: 41%, 37% in the overall population.
Timing of Delivery: The average delivery date of the monitored group was 39+3, the population as a whole was 37+5 and the babies with birthweight under the 10th centile 36+2. There was no difference in the gestation range. There were no difference in cord gasses



Conclusions Overall the monitored group were delivered, on the average, at later gestations. Arterial and Venous blood gasses were equivalent and rates of caesarean section were similar in the monitored group and the wider population. The monitored group had at least one risk factor for growth restriction identified in the ante-natal period, yet were born at later gestations with no worse outcomes.

3.8 PO IMPROVING BIRTH OUTCOMES: A PROSPECTIVE AUDIT OF THE DETECTION AND MANAGEMENT OF SMALL FOR GESTATIONAL AGE (SGA) FETUSES.

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Introduction: Stillbirth rates in the UK are one of the highest in the developed world. Using ReCoDe classification, 43% of stillbirths can be attributed to intrauterine growth restriction (IUGR). Small for gestational age (SGA); <10th centile on a customized growth chart, is synonymous with IUGR. Risk of stillbirth is reduced when IUGR is detected antenatally compared to undetected. Royal College of Obstetricians and Gynaecologists (RCOG) 2013 guidance stratifies antenatal care in those at risk of SGA.
Objectives:

- Determine whether women identified 'at risk of SGA' receive appropriate antenatal care according to RCOG guidance
- Compare detection rates of SGA in women who received appropriate vs. inappropriate antenatal care according to RCOG guidance;
- Compare intrapartum management and perinatal outcomes where SGA was detected vs. undetected antenatally.

Methods: We prospectively collected anonymised data for 494 consecutive singleton deliveries in BH&SCT (8.6% of annual singleton births). Clinical risk for SGA, birth weight, antenatal and intrapartum management and birth outcome data were analyzed using "IBM - Statistical analysis software package - SPSS Statistics."
Results: In total, 33% (165/494) of women were categorized at risk of SGA in accordance with RCOG guidance (minor 42, major 123). Overall, 56% (91/163, 2NA) were managed appropriately antenatally, with 65% (79 of 121, 2 NA) and 29% (12/42) in major and minor risk groups respectively. Across all categories (including 'low risk) 11% (56/493, 1 missing) of babies were SGA at birth with a 55% (30/55, 1 missing) antenatal detection rate. SGA babies detected antenatally were on average delivered 13 days earlier than their undiagnosed counterparts. A higher proportion were delivered by caesarean section (50% vs 32%).
Conclusion: Our data suggests detection of SGA results in earlier delivery and changes the mode of delivery. Further research is required to ascertain whether antenatal detection of SGA impacts intrapartum management and perinatal outcomes.

3.9 PO MATERNAL IMPACT ON FETAL BIRTHWEIGHT AND LENGTH FROM 2000-2015 WITHIN A GERMAN FEDERAL PROVINCE (HESSEN, 6 MILLION INHABITANTS)

Kathrin Noever[1], Nina Timmesfeld[2], Björn Misselwitz[3], Birgit Arabin[1]
[1.] Center of Mother and Child, Philipps University Marburg and Clara Angela Foundation, Witten and Berlin
[2.] Department of Medical Biometry, Philipps-University Marburg/ Germany,
[3.] Institute of Quality Assessment Hessen, Eschborn / Germany,

Objective: To test the impact of maternal weight, size, lifestyle and disease on fetal growth during 15 years of perinatal data registration.
Method: A huge perinatal data base of in total 802 783 pregnancies with singletons (n=788 774), twins (n=13 618) or higher order multiples (n= 391) was used after an intense plausibility check of all data. During an interval of 15 years we analysed (the impact on) fetal growth.
Results: During the interval, the median birthweight (BW) and length at birth of singletons both decreased ($p < 0.0001$, linear regression). When adjusting for maternal age, maternal weight, parity, maternal education, smoking, by multiple linear regression we found that results did not change.
Tall $\geq$ 180 cm (n = 8 279) and small $\leq$ 150 cm (n=6 680) women delivered singletons with a mean BW of 3 623 and 3 104 grams or twins with a mean BW of 2586 and 2133 grams respectively. The mean length of children were 53 and 50 cm for singletons or 48 and 45 cm for twins.
Conclusion: The data motivated us to establish customized growth charts from this data base.

3.10 PO CUSTOMISED BIRTHWEIGHT STANDARDS FOR A SPANISH POPULATION

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Objective: To derive new coefficients for adjustable standards to assess customised birthweight in a Spanish population
Methods: We included 18,801 term singleton pregnancies in the period between January 2007 and January 2017. Pregnancies were dated with the Crown-rump length measured at 8-10 weeks of gestation. Maternal height and weight, and maternal age, ethnicity, parity and smoking status were recorded at the first antenatal visit. A multivariate linear regression with stepwise (backward) elimination was used to obtain coefficients for significant variables. A model based in 17,951 "supernormal" patients was centred on a standard mother with height 163 cm, booking weight 64 kg, gestation 280 days and parity zero. Afterwards, we excluded the pathological variable coefficients in the calculation of a 'customised' centile.
Results: 56.7% were nulliparous and 97.9 % Caucasian. 22.5% of the cohort were overweight or obese, 9.4% of women smoked during pregnancy and 43.3% had a previous pregnancy. The median gestation was 278 days.
The covariates used to model birthweight (in grams) are shown in the table(attached) and comprise both physiological (gestation, maternal height and weight, parity, ethnicity and baby sex) and pathological (smoking, hypertension and diabetes) variables.
Conclusion: In this study, we have found that several maternal and fetal physiological characteristics (fetal gender, smoking status or parity) significantly account for the expected optimal weight. In addition, we have constructed birthweights standards for the contemporary Spanish population.

3.11 PO IS THERE ANY RELATIONSHIP BETWEEN NON-O BLOOD TYPE AND PREGNANCY WITH FETAL GROWTH RESTRICTION?

Joana Araújo Pereira, Marina Gomes, Vera Trocado, José Pedro Coutinho, Agostinho Carvalho, Paula Pinheiro - Department of Obstetrics and Gynecology, Alto Minho Local Unit, Viana do Castelo, Portugal

Introduction: ABO blood type is recognized to be associated with several diseases. For instance, clinical evidence shows that non-O blood type individuals have a higher risk to develop thrombosis than O type subjects. Fetal growth restriction (FGR) is related with placentae's thrombotic disease, which may contribute to adverse pregnancy outcomes.
Objective: The aim of the present study is to determine whether maternal non-O blood type contributes to both FGR and low birth weight.
Methods: Medical data including ABO phenotypes were collected from hospital electronic database and retrospectively reviewed. This is a case-control study comparing maternal ABO blood type between women whose pregnancies were complicated by FGR and a control group of women who had fetuses with normal growth. Pregnancies complicated with hypertensive disorders or diabetes or other important chronic diseases were excluded from both groups. Mothers exposed to alcohol or cigarettes were not included. The statistical significance evaluated by the Chi-square test and a p value<0.05 was considered statistically significant.
Results: A total of 1936 subjects mothers that give birth were involved in this study, 159 pregnancies were complicated by FGR (8,2%). Overall 787 (40,7%) women had type O blood, 897 (46,3%) had type A blood, 160 (8,3%) had type B blood and 92 (4,8%) had type AB blood. In terms of lower birth weight, there are no significant differences between pregnant women with non-O blood type and pregnant women with O blood type. Furthermore, this study doesn't show an association between ABO blood type with FGR or with low birth weight.
Conclusion: FGR is a multifactorial condition and maternal ABO blood type alone doesn't appear to be a predictor.

3.12 PO HIGH BLOOD VISCOSITY: A RISK FACTOR FOR FETAL GROWTH RESTRICTION?

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Background: Numerous studies have reported the association between maternal anemia during the third trimester of pregnancy and fetal growth restriction (FGR). However, the association between high blood viscosity and FGR has rarely been explored. Some authors suggested that higher blood viscosity or a lack of hemodilution, assessed by using hemoglobin (Hb) levels, are risk factors for poor placental perfusion.
Objective: The aim of this study is to assess the relationship between maternal Hb at 32-34 weeks gestation with FGR, after excluding women with anemia.
Methods: A retrospective study was conducted. This is a case-control study comparing maternal Hb levels at 32-34 weeks' gestation between women whose pregnancies were complicated by FGR and a control group of women who had fetuses with normal growth. Pregnancies complicated with hypertensive disorders or diabetes and mothers with anemia, uterine malformations, and kidney disease or other important chronic diseases were excluded from both groups. Mothers exposed to alcohol, cigarettes or teratogens were not included. A logistic model was used to adjust for confounding variables and to calculate adjusted odds ratio (AOR) and 95% confidence interval (CI).
Results: A total of 2108 singleton pregnancies was included, 188 pregnancies were complicated by FGR (8,9%). In the third trimester of gestation, the average Hb level in women of the group with FGR was higher than in women of the group without FGR (p=0.009). Increased Hb at 32-34 weeks gestation is associated with FGR (AOR, 1.27; 95% CI, 1.08–1.50; p=0.004), after adjusting for pre-pregnancy weight, parity, assisted reproductive technologies use and extremes of maternal age.
Conclusions: High blood viscosity during the third trimester, assessed by using Hb levels, was associated with FGR. These new data may represent a novel parameter to consider in future investigations.

3.13 PO PREDICTORS OF VAGINAL DELIVERY AMONG GROWTH-RESTRICTED FETUSES

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Background: Growth-restricted fetuses are a high-risk group whose labor is more likely to develop labor abnormalities requiring intervention.
Objective: The aim of this report is to determine factors that influence vaginal delivery among growth-restricted fetus.
Methods: Records of all growth-restricted fetus born between September 2015 and May 2017 were reviewed. Information about each patient's social demographic factors and physical characteristics, events in labor and mode of delivery were recorded. Pregnancies complicated with hypertensive disorders or diabetes and fetuses with absent or reversed end-diastolic flow in umbilical artery were excluded. Multivariate analysis was done using logistic regression. A *p* value<0.05 was considered statistically significant.
Results: A total of 187 growth-restricted fetuses delivered during the study period were eligible. Vaginal delivery was achieved in 146 (78.1%) of the eligible parturient, while 41 (21.9%) had emergency caesarean delivery. Indications for the caesarean delivery were: failure to progress (12 cases), fetal distress (25 cases), failed induction labor (3 cases), and abruption placentae (1 case). The birth mean weight was 2.6 ± 0.34 kg. Multiparity (adjusted odds ratio [AOR] = 0.29, 95% confidence interval [CI] = 0.01-0.84; p=0,023), spontaneous onset of labor (AOR=0.21, 95%CI=0.01-0.5; p<0.001) and young maternal age (AOR=0.92, 95%CI=0.86-0.99; p=0,028) were predictors of successful vaginal delivery. Birth weight or growth percentile, umbilical artery blood flow changes, oligohydramnios and previous BMI, were not found to be predictors of vaginal delivery.
Conclusion: Among growth-restricted fetuses, young maternal age, multiparity and spontaneous onset of labor were the best predictors of successful vaginal delivery.

Poster – Oral 2 (Session 9)

9.1 PO A MOUSE MODEL OF ADVANCED MATERNAL AGE – UNDERSTANDING MOTHERS' VULNERABILITY TO FETAL GROWTH RESTRICTION AND LATE STILLBIRTH

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Objective: Advanced maternal age (AMA; ≥35 years old) is associated with increased risk of fetal growth restriction (FGR) and stillbirth. AMA pregnancy is associated with placental dysfunction.[1] However, the underlying mechanisms are not known. Previous studies demonstrated decreased pup viability in 40 week old mice[2] however fetal weight and placental function were not investigated. We hypothesised that an aged mouse model may provide a valuable model for delineating the mechanisms causing increased FGR and stillbirth rates seen in AMA.
Method: Young (con; 8-12wk) and aged (38-41wk) C57Bl/6J virgin mice were mated with C57Bl/6J males (10-16wk). At E17.5 (E19.5=term), dams were culled and placentas and fetuses were harvested for anthropometric and functional measurements.
Results: At E17.5, 56% of pups of ageing mice were classified as FGR (<5th centile of control population). 14% of pups were non-viable (stillborn) and 31% of litters contained at ≥1 stillborn fetus. These litters were associated with placental dysfunction, with significantly reduced placental efficiency as measured by fetal:placental weight ratio in those viable (6.87±1.65) and non-viable (4.47±1.48) compared to control (10.59 ±0.89; mean±SD; p<0.001, Kruskal-Wallis); and a 45-58% reduction of nutrient transfer from mother to fetus (p<0.001, Mann-Whitney U). Pups that survive exhibit signs of placental adaptive mechanisms thought to protect fetal survival, including 29.4% increase in placental growth, which are absent in the pups that die in utero.
Conclusions: Ageing affected pregnancy outcome in C57 mice, similar to findings in human studies. The findings provide evidence of placental dysfunction and suggest reduced placental efficiency. These studies provide a novel and invaluable model to characterise why some FGR babies die and the placental phenotype in stillbirth. These data support the use of the ageing mouse as a model for investigating the underpinning mechanisms linking AMA and poor outcome seen in humans.

9.2 PO FETAL CONGENITAL HEART DISEASE AND INTRAUTERINE GROWTH RESTRICTION.

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Objective: Fetal congenital heart defects may lead to abnormal fetal growth. In case of fetal heart defects birth weight has a substantial effect on success of operative therapy. Our objective was to estimate the association between fetal congenital heart disease (CHD) and intrauterine growth restriction (IUGR).
Methods: Outcome data was collected from singleton pregnancies undergoing fetal echocardiography for suspicion of congenital heart defect at a tertiary perinatal cardiology center in Warsaw Poland between 2009 and 2017. We analyzed the growth patterns in 3 types of cardiac defects: tetralogy of Fallot, hypoplastic left heart syndrome and transposition of great arteries. Fetuses from multiple pregnancies, with abnormal karyotype and having other major structural defects were excluded form the study. We defined abnormal growth as birth weight below the 10th percentile.
Results: Among 2015 fetuses with cardiac defects, there were 113 cases of TOF, 178 cases of HLHS and 59 cases of TGA. 4 % of fetuses with TGA where below the 10th percentile, while 6% of HLHS fetuses and 19% of TOF fetuses. This cardiac defect resulted in the highest risk of abnormal growth.
Conclusion: Not all fetuses with congenital heart defects have an increased risk of abnormal intrauterine growth that is higher than that in the general population. We found that the highest risk was in fetuses with tetralogy of Fallot. We believe that it is important to assess the relationship between abnormalities of implantation and risk of congenital heart defects. Early interventions in the first trimester could ameliorate fetal growth patterns in some of the fetuses with congenital heart defects.

9.3 PO FETAL GROWTH RESTRICTION – DOES ASYMMETRY MATTER?

Ciara Ní Laighin MSc [1], Gerard Burke FRCOG [1], Julia Unterscheider MD [2], Sean Daly MD [3], Michael Geary MD [4], Mairead Kennelly MD [5], Fionnuala McAuliffe MD [6,7], Keelin O'Donoghue PhD [8,9], Alyson Hunter MD [10], John Morrison MD [11], Patrick Dicker PhD [12], Elizabeth Tully PhD [13], Fergal Malone MD [13]

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Objective: The Prospective Observational Trial to Optimize Pediatric Health in IUGR (PORTO) Study evaluated the optimal management of growth-restricted fetuses. In this secondary analysis, we investigate the ability of ratios of head circumference (HC) to abdominal circumference (AC) and femur length (FL), as determinants of symmetric and asymmetric growth, to predict adverse perinatal outcome.

Method: The PORTO study prospectively followed 1,116 non-anomalous ultrasound-dated singleton pregnancies with an estimated fetal weight (EFW) <10th centile. Serial sonographic evaluation, including biometry and multi-vessel Doppler, was carried out from enrolment to delivery. Adverse perinatal outcome was defined as a composite of intraventricular hemorrhage, periventricular leukomalacia, hypoxic ischemic encephalopathy, necrotizing enterocolitis, bronchopulmonary dysplasia, sepsis and death. From the biometric measurements at the final ultrasound examination of each pregnancy, HC/AC and HC/FL ratios were calculated and used as indicators of symmetry or asymmetry. Logistic regression and receiver operating characteristic curves (ROC) were used to analyze the ratios as predictors of adverse perinatal outcome.

Results: The HC/AC and HC/FL ratios were significantly higher in the 57 (5.1%) growth-restricted fetuses with the composite adverse outcome compared with those without adverse outcome ($p<0.0001$). The optimal cut-offs were 5.0 for HC/FL and 1.1 for HC/AC, from ROC curve analysis. Both ratios had similar specificities (approximately 84%) but HC/AC had better sensitivity than HC/FL (77% vs. 67%).

Ratio	Optimal Cutoff	Sensitivity	Specificity	AUC	LR^+	LR^-
HC/FL	5.0	67% (38/57)	84% (888/1058)	0.84	4.2	0.39
HC/AC	1.1	77% (44/57)	83% (883/1058)	0.88	4.5	0.28

Table: Fetal Biometry Ratios at final scan and Adverse Perinatal Outcomes

Conclusion: Asymmetry, demonstrated by elevated HC/FL and HC/AC ratios, remains a clinically useful predictor of adverse perinatal outcome in growth-restricted fetuses below the 10th centile, with the HC/AC ratio in particular performing optimally.

9.4 PO HYPERTENSIVE DISORDERS AND FETAL GROWTH RESTRICTION IN HIGH RISK OF PRETERM BIRTH PREGNANCIES

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Disorders of deep placentation are present in hypertensive disorders(HD), fetal growth restriction(FGR), spontaneous preterm birth(sPTB) and preterm premature rupture of membranes(PPROM).
Objective: To describe the incidence of HD and FGR in women with high-risk of preterm birth(HRPTB) and their perinatal outcomes.
Methods: A retrospective observational study was conducted. We collected information of women with HRPTB that developed HD or/and FGR during pregnancy.
Results: 392 women were studied; 18(4.6%) developed HD, 22(5.6%) were diagnosed with FGR, 4(1%) with both entities (HD&FGR) and 304(77.5%) were normal in terms of HD and birth weight. 44(11.2%) cases were lost.
There were no differences between groups related to maternal characteristics (age, toxic habits, race or BMI). But in FGR and HD groups, a greater number of cases were found using assisted reproduction techniques(ART). Regarding to risk factors for PTB, there was an increase in PPROM in patients in the FGR(23.8%) and HD&FGR(75%) groups, with statistically significant differences(p=0.002).
No statistical differences were observed gestational age at delivery (between groups). An increase in the proportion of cesarean sections in the FGR and HD&FGR groups was observed (p=0.008).
Analyzing neonatal outcomes, fetuses from the FGR and HD&FGR groups had a lower birth weight than those from other groups (p<0.001), presenting also lower APGAR in the first minute (p<0.001) and lower arterial pH(p=0.002). In terms of neonatal ICU(NICU) admission, the highest admission rates were found in FGR and HD&FGR groups (p=0.008) with also a higher number of acute and late SDRA.
Conclusion: The incidence of HD and FGR weren't increased in our HRPTB pregnancies. We observed more ART pregnancies and PPROM in HD-FGR groups. Worse perinatal outcomes, in terms of fetal weight, APGAR scores and blood cord pH, NICU admissions and SDRA were found in FGR-HD groups. But higher number of cases will be needed for stronger evidence.

9.5 PO THE IMPACT OF SMALL FOR GESTATIONAL AGE BIRTH FOR MOTHERS AND INFANTS: ANALYSIS OFOUTCOMES FROM THE PREDICT STUDY

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Objective: Small–for–gestational age (SGA) refers to an infant with a birth weight <10th centile. SGA fetuses are at risk of stillbirth, poor neonatal outcomes and complications in adulthood. This study examines short term outcomes of SGA among women and their infants in the PREDICT study; an observational study examining predictors of pre-eclampsia (PET) in high risk women.
Methods: Analysis was performed among women recruited to PREDICT (n=232). Outcomes were collected following delivery in a tertiary centre in Northern Ireland. Maternal outcomes included: length of stay (LOS), admission to ICU/HDU, mode of delivery and PET. Neonatal outcomes included: gestational age at delivery, LOS and admission to ICU. The data were analysed by Chi-squared and one-way ANOVA tests using SPSS.
Results: Outcomes were studied in 227 women. Mean (SD) birthweight and GROW centile were 3285 (813) g and 49th centile (32), respectively. The SGA rate was 14% (n=32). Rates of PET were higher in women with SGA infants; (42% *v* 9%, OR 7.2, 95% CI 2.9-18.2, P<0.001). There was no difference in maternal LOS (mean, IQR); (3 (2-6) *v* 3 (2-5) days, P=0.69) or ICU/HDU admission (3% *v* 5%, P=0.52). More women had vaginal deliveries in the SGA group, however there was no significant difference between groups (72% *v* 61%, P=0.16). Median (IQR) gestational age at delivery was lower for SGA infants (median 37.6 (34.2-39.6) *v* 39.0 (37.4-39.9) weeks, P<0.001). Delivery <37 weeks gestation was almost 3 times higher in SGA neonates (38% *v* 16%, OR 3.2, CI 1.4-7.2, P=0.006) and length of neonatal stay (IQR) significantly longer (3 (2-39) *v* 3 (2-4) days, P<0.001). There was no difference in admission rates to NICU (14% v 12%, P=0.5).
Conclusions: SGA delivery is associated with significant maternal and fetal morbidity, much of which may be explained by higher rates of PET and prematurity.

9.6 PO THE IMPACT OF ASPIRIN ON 3D PLACENTAL VOLUMES AND VASCULAR FLOW INDICES IN THE FIRST AND SECOND TRIMESTERS OF PREGNANCY AND CORRELATION WITH UTERINE ARTERY DOPPLER: RESULTS OF THE TEST MULTICENTRE RCT

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Objective: Aspirin 75mgs can prevent the onset of placental disease in at risk populations. The objective of this study was to examine the impact of aspirin on uterine artery (UtA) doppler, three dimensional (3D) placental volume and 3D power doppler (3DPD) indices; vascularization index (VI), flow index (FI) and vascularization flow index (VFI) in the second trimester of pregnancy.

Methods: This sub-study was based upon 546 women within the multicentre RCT randomised to: (i) 75mg aspirin from 11-14 weeks, (ii) no aspirin, (iii) aspirin based upon a positive Fetal Medicine Foundation pre-eclampsia screening test. FMF risk factors for pre-eclampsia were recorded for all three groups. The results of the screening algorithm were only revealed and guided management in group 3. The risk of pre-eclampsia for groups 1 and 2 was calculated at the completion of the study and was therefore not revealed to those study participants. UtA Doppler and 3D placental volumes and 3DPD indices were assessed between 11-14 weeks and again at 20-22 weeks gestation on a Voluson 730 Expert. This study was carried out by Perinatal Ireland and the Mother and Baby Clinical Trials Network.

Results: No difference was noted between the aspirin and non-aspirin taking groups at baseline. Following administration of aspirin 75mgs no difference was noted in UtA Doppler, placental volume and 3DPD indices. Median interquartile range (IQR) and p-values from Wilcoxon Rank Sum test are presented in table 1.

Conclusion: Any perceived effect that aspirin may have on uteroplacental vasculature is not reflected in placental volume judged by 3D ultrasound, nor by uterine artery doppler changes. Ultrasound may not be sensitive enough to detect the mechanisms of aspirin on placental development in the prevention of placental disease.

9.7 PO ACCURACY OF THE FETAL CEREBROPLACENTAL RATIO FOR THE DETECTION OF INTRAPARTUM COMPROMISE IN NON-SMALL FETUSES

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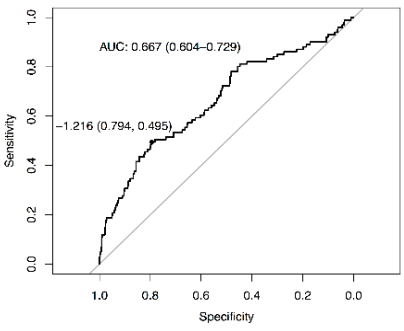
Objective: To study the accuracy of the cerebroplacental ratio (CPR) for the detection of intrapartum fetal compromise (IFC) in fetuses with estimated fetal weight (EFW) and birth weight (BW) over the 10th centile.

Methods: This was a prospective study of 569 fetuses attending the day hospital unit of a tertiary public hospital. All fetuses underwent an ultrasound examination including CPR and fetal biometry at 36-40 weeks, and were delivered within 4 weeks. Only fetuses with an EFW and a BW over the 10th centile were included. IFC was defined as a composite of: abnormal intrapartum fetal heart rate or intrapartum fetal scalp pH <7.20 requiring cesarean section, neonatal umbilical cord pH <7.20, 5' Apgar score <7 and postpartum admission to neonatal intensive care units. The accuracy of CPR for the prediction of IFC was calculated alone and in combination with other parameters using univariate and multivariate logistic regression models. ROC curves were calculated to evaluate the accuracy of models predicting IFC.

Results: The incidence of IFC was 17.9% in the study cohort. CPR sensitivity was 14.7% for 5% and for a FPR of 10%. ROC analysis showed an AUC of 0.62 (95% CI: 0.55, 0.68, p<0.001) with an optimal CPR MoM threshold at 0.83 MoM. For a false positive rate (FPR) of 10%, the detection rate was 30.4%. The Positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (+LR) and negative LR were 31%, 86%, 2.1 and 0.72, respectively. The multivariate analysis showed that only fetal gender and parity increased the predictive accuracy of CPR alone, but this improvement was small (AUC = 0.67, 95% CI = 0.60, 0.73, p<0.001).



Conclusion: Despite their apparent normality, a proportion of fetuses with growth over the 10th centile may suffer intrapartum compromise. Some of these are suitable for detection at the day hospital unit by means of CPR evaluation.

9.8 PO SERIAL ULTRASOUND ASSESSMENT FROM 28 WEEKS IS UNNECESSARY IN BABIES AT MODERATE RISK OF FETAL GROWTH RESTRICTION (FGR)

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Introduction: FGR in a prior pregnancy is associated with recurrent FGR; as a result many guidelines recommend serial ultrasound from 28 weeks. Small for gestational age (SGA; <10th centile) is used as a proxy for previous FGR. We investigated the risk of SGA in women with previous SGA to assess the need for serial assessment from 28 weeks.
Methods: Birthweight centiles from prior pregnancies and the index pregnancy were calculated in consecutive women seen in the Manchester Placenta clinic with a history of SGA ≤10th centile (Perinatal Institute). The risk of SGA was examined in relation to the delivery gestation and birthweight centile of prior pregnancies.
Results: 517 women had at least one previous pregnancy with a birthweight centile ≤10th, of whom 255 were between 3rd-10th centile. Of these, 16/255 (6.7%) delivered a baby ≤3rd centile in the index pregnancy, compared to 31/262 (13.4%) babies in the previous ≤3rd centile group (OR 2.00 [1.1-3.8]). In this cohort preterm (<37 weeks) delivery was indicated in 10/517 (1.9%); one pregnancy (0.04%) from the previous 3rd-10th centile group (previous pregnancy 4th centile). This baby required delivery <32 weeks along with 5/517 (2.2%) babies from the previous ≤3rd group. A single previous preterm delivery was not predictive of preterm SGA (5/20) or SGA centile ≤3rd in the index pregnancy (5/47), however the risk of preterm SGA was increased with >1 prior preterm delivery (OR 12.55[3.19 -49.40]).
Conclusions: Early FGR is rare in women with a previous history of normotensive SGA; previous pregnancies with birthweight centiles between 3rd-10th centile have a very low risk of early FGR. This suggests that serial ultrasound assessment beginning at 28 weeks should be targeted to women with a previous baby ≤3rd centile; surveillance beginning at 32-34 weeks could be safely initiated in women with a previous 3-10th centile infant.

Poster – Oral 3 (Session 10)

10.1 PO COMBINED SCREENING FOR SMALL FOR GESTATIONAL AGE AT 11–13 WEEKS

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Objective: To evaluate implementation of combined screening for delivery of small for gestational age baby (SGA) into the first-trimester screening for adverse obstetric outcomes at 11-13 weeks.
Method: This was a prospective observational study in women attending the first-trimester combined screening at 11-13 weeks. The risk of SGA was calculated by ASTRAIA software gmbh from maternal characteristics, uterine artery pulsatility index, mean arterial pressure, serum pregnancy-associated plasma protein-A and placental growth factor. Women at risk for SGA started with the prophylactic use of low-dose aspirin in early pregnancy. We estimated the detection rate (DR), false-positive rate (FPR), positive predictive value (PPV) and negative predictive value (NPV) for the prediction of delivery SGA baby according to INTERGROWTH standards below the 5th percentile.
Results: The study population of 1538 singleton pregnancies was examined. When screen positivity was defined by risk cutoff of 1:150 using the algorithm for SGA, 15.3% (n = 235) of women were screening positive and the incidence of SGA was 3.3% (n = 51). The DR, FPR, PPV and NPV in the prediction of delivery SGA baby were 29.4%, 14.8%, 6.4% and 97.2%, respectively.
Conclusions: The first-trimester combined screening is an effective method for selection of women at risk for SGA which should start with the prophylactic use of low-dose aspirin in early pregnancy.

10.2 PO EVALUATION OF DEPRESSION, STRESS, SOCIAL SUPPORT AND SELF-ESTEEM IN PREGNANT WOMAN WITH SUSPECTED FETAL GROWTH RESTRICTION

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Objective: The goal of this study is to compare pregnant women with suspected FGR to pregnant women without any clinical history of depression, stress, social support and self-esteem.
Method: Primary Care Evaluation of Mental Disorders and Prenatal Psychosocial Profile were administered to 76 pregnant women with suspected FGR and 92 low-risk pregnant women in order to investigate the presence of depression and levels of stress, social support and self-esteem.
Results: Prevalence of depression was 17.7% among pregnant women with suspected FGR and 16.3% among those without any clinical history. In the association between the groups with suspected FGR and depression(FGR+D) and with suspected FGR and no depression(FGR-D) was verified a statistical significance between stress($p<0.01$) and self-esteem($p<0.01$). Among the groups with no clinical history but with depression(BR+D) and those without clinical history with no depression(BR-D) we found statistical significance between stress($p=0.04$) and self-esteem($p<0.01$). Analyzing groups FGR+D and BR-D, we found statistical significance considering stress($p<0.01$) and self-esteem($p<0.01$). Groups BR+D and FGR-D presented statistical significance considering self-esteem($p=0.03$).
Limitations: The population without any clinical history used is partly composed of employees and students of the hospital, thus they may not be representative of the country's general population.
Conclusions: Presence of depression was detected during pregnancy and is associated to higher levels of stress and lower levels of self-esteem, in both groups studied

10.3 PO INTRA AND INTER-EXAMINER VARIABILITY IN FRACTIONAL THIGH VOLUMES (TVOL) IN PREGNANCIES COMPLICATED BY MATERNAL PRE-EXISTING DIABETES AND OBESITY

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Objective: Pregnancies complicated by pre-existing diabetes are at high risk of developing pathological deviations in fetal growth. The use of 3D volume sonography (fractional thigh volume; TVol) has been shown to improve accuracy in fetal weight estimation as compared to standard 2D ultrasound, but this has not previously been used in pregnancies complicated by pre-existing diabetes and increased BMIs. This study assessed the intra and inter-examiner reliability of TVol in a cohort of pregnancies complicated by pre-existing diabetes to determine if this measure might be useful in the management of the pregnancy disease.

Method: Nested case-control of 9 women with pregnancies complicated by pre-existing diabetes and with a BMI >30 who had TVol at 5 time points (15-19, 22-24, 26-28, 30-32 and 34-36 weeks) performed by two investigators (AD, ZT). Each TVol was measured and analysed three times by AD, followed by blinded analysis by ZT to assess intra-examiner variability. Coefficient of variation (CoV) was calculated to assess intra-examiner variability. GraphPad Prism7 was used to create Bland-Altman plots to assess inter-examiner variability.

Results: Median BMI 36.6 (IQR 31.6-40.2), median gestation at delivery 264.9 (IQR 260.5-270.5) days, median birth weight centile 87.9 (IQR 43.6-92.55). Intra-examiner variability CoV were 0.172 (15-19 weeks), 0.104 (22-24 weeks), 0.173 (26-28 weeks), 0.07 (30-32 weeks) and 0.05 (34-36 weeks). Inter-examiner variability assessed using Bland-Altman plots during the 2nd (15-24 weeks) and 3rd (24-36 weeks) trimester (see figure 1).

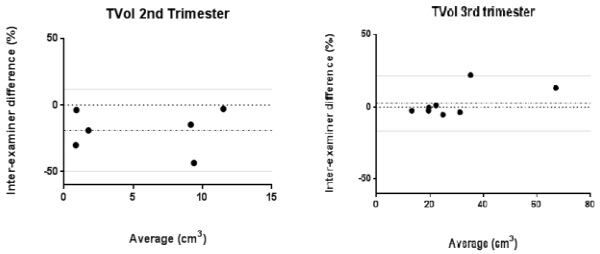

Figure 1: Systematic bias depicted by a dotted black line; 95% limits of agreement depicted by solid grey lines.

Conclusion: Our pilot data suggests that TVol is reproducible in pregnancies complicated by pre-existing diabetes and obesity. Intra-examiner variability improved with advancing gestation and inter-examiner variability did not show systematic bias reflected by the 95% limits of agreement crossing zero. Further study participants are required to confirm these findings in this group.

10.4 PO SINGLE FRACTIONAL THIGH VOLUME IMAGE ACQUISITION AND ANALYSIS HAS IMPROVED REPRODUCIBILITY COMPARED TO THE AVERAGE OF MULTIPLE IMAGES.

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Objective: The use of fractional thigh volume measurements (TVol) may improve the accuracy of ultrasound calculated fetal weight estimation. TVol is calculated by manually tracing the central portion of the femur diaphysis. This study compared the coefficient of variation obtained from an average TVol of repeated measurements or a single "best" image TVol result.

Method: TVol images were obtained between 17 and 37 weeks gestation. Following acquisition a retrospective analysis was performed using Voluson 4DView by two blinded investigators (ZT and AD). TVol measurements were obtained by two methods. 1. Subjective measurement of the "best" of 3 images, judged as that image with the smallest cross-sectional femur view. 2. Mean TVol value of three images. The mean, standard deviation and coefficient of variation (CoV) were then calculated to assess repeatability and inter-examiner variability.

Results: The median CVs were 0.019 [0.008-0.03] and 0.032 [0.007-0.09] for method 1 and 0.046 [0.019-0.121] and 0.061 [0.027-0.274] for method 2, respectively.Between investigators, there was no evidence of significant systematic bias as gestation increased with either technique (method 1 bias 5.7 [-5.7-17.15] and method 2 bias 7.0 [-19.3-5.2]; Fig. 1). However, there was a consistent measurement bias between the investigators.

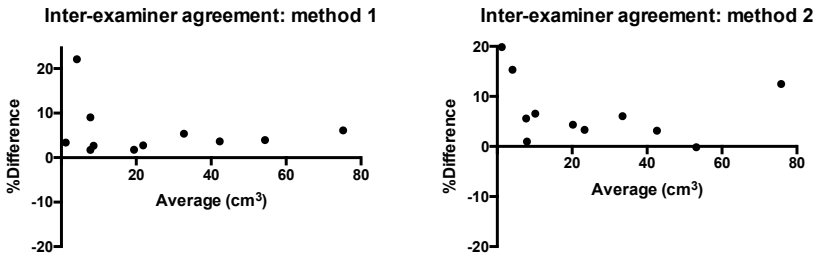

Fig. 1: Inter-observer reliability of fractional thigh Volumes (TVol measurements using Bland-Altman plots

Conclusion: This study suggests that single "best" image (from three image acquisitions) appears to have improved repeatability and inter-examiner variability compared with the average of three measurements. Additional numbers are necessary to confirm this finding and ensure that the protocols for application of this technique have the reproducibility and validity necessary for routine clinical practice.

10.5 PO THE ROLE OF SONOGRAPHERS IN SUPPORTING FAMILIES PREGNANT AFTER LOSS : A QUALITY IMPROVEMENT PROJECT

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Womens and Babies Program, Sunnybrook Health Science Centre; Toronto, Ontario, Canada.

Objective: Parents' experiences of pregnancy are profoundly altered by previous perinatal death, demonstrated by reports of anxiety, increased interactions with the healthcare system, and lack of trust in a good outcome. Families consistently report experiencing emotions such as fear, vulnerability, and worry preceding and during the scan. As fetal growth measurements often play an important role in positive pregnancy outcomes and additional scans are common, sonographers play a crucial role in offering skilled and compassionate care to these families.
Methods: In response to a gap in care identified by local families, the Subsequent Pregnancy Program was initiated to better offer expert care by knowledgeable care providers, including sonographers. Based on literature findings and family feedback, sonographers work as part of the interprofessional team to provide unique care options. Sonographers are given the family's history prior to performing the scan and families are given tools to advocate for their unique needs during ultrasounds. Team learning opportunities are provided and Program feedback is regularly reviewed.
Results: All families received additional ultrasounds in their pregnancies after loss. Feedback from families indicates satisfaction with certain care options, such as when they are scanned by the same sonographer who is skilled and caring, they can avoid repeating their history of loss, and explanations are given for delays. Suggestions for ongoing improvements include tailoring ultrasound to individual needs, starting the ultrasound scan by locating the fetal heartbeat, having a better system for identifying qualifying families, and prioritizing the same sonographer.
Conclusions: There is an urgent need to improve the ultrasound experience of families pregnant after loss. Sonographers have a major role in the provision of skilled, informed, and sensitive care. Innovation plays a key role in the provision of care, and strategies learned from this Quality Improvement Project are adaptable to different practice locations and processes.

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10.6 PO VALIDATION OF REFERENCE CHARTS FOR MID-TRIMESTER FETAL BIOMETRY

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Objective: The aim of our study was to assess charts proposed for international use in the Intergrowth-21st Project.
Method: Ultrasound data were collected from 43.923 healthy singleton pregnancies examined at 18-23 weeks of gestation in the Netherlands. Fetal measurements were converted into Z-scores using previous and current Dutch reference charts and Intergrowth charts. The distributions of the Z-scores were compared to the expected standard normal distribution.
Results: Charts previously used in the Netherlands were not optimal for assessment of fetal biometry in our region. The current charts fit the population well. Intergrowth curves perform well for head circumference and biparietal diameter, but not for abdominal circumference (AC) and femur length (FL). Compared with populations in the Intergrowth study, the Dutch population is relatively tall and the prevalence of diabetes is low.
Conclusions: Whilst the establishment of the Intergrowth charts is an important step towards worldwide uniformity, for our population locally derived charts still perform better, especially for AC and FL. Results from our validation study confirm that distinction between normal and pathologically small babies may be improved by taking maternal size into account.

10.7 PO MATERNAL RESIDENTIAL PROXIMITY TO MAJOR ROADS AND PLACENTAL FUNCTION

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(Sant Joan de Déu Hospital Barcelona and Hospital Clinic), Spain.

Background: Maternal residential proximity to major roads has been associated with impaired fetal growth. However, the available evidence on the impact of maternal residential proximity to major roads on placental function is non-existent.
Objective: To evaluate the association between maternal residential proximity to a major road on placental function.
Methods: A prospective cohort study including 842 term singleton pregnancies recruited in the fetal medicine department of BCNatal (Sant Joan de Déu Hospital Barcelona and Hospital Clínic) between June 2014 and October 2016. Residential proximi*ty was defined as living within* 200 meter of a major road. Placental function was characterized by means of Doppler ultrasound measurements of umbilical artery (UA) pulsatility index (PI), aortic isthmus (AI) PI, uterine artery (UtA) PI, middle cerebral artery (MCA) PI and cerebroplacental ratio. Two groups were considered: (1) babies with birth weight < 10^{th} centile and (2) babies with birth weight ≥ 10^{th} centile. Data on a wide range of potential covariates including socioeconomic status, demographic characteristics, lifestyle, medical history and physical examination were obtained through questionnaires and hospital records. Because of multi-level structure of the data (subjects within hospitals), we will develop mix effects models with a hospital random effect to assess the association between residential proximity to a major road on indicators of placental function (one at a time).
Results: The analyses are currently on going and the final results are being expected to be ready before the conference date.
Conclusions: Our study is the first to evaluate the effect of residential proximity to major roads on placental function. Such an effect, if confirmed by our study, will shed light over a potential mechanism underlying the reported association between such an exposure and impaired fetal growth and in time, will have important policy implications.

10.8 PO AORTIC INTIMA MEDIA THICKNESS IN FETUSES OF UNDERWEIGHT AND OBESE WOMEN

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Objective: Being underweight and obese are significant problems for women and their offspring during pregnancy, delivery, and puerperium. To understand this range of weight-related problems, in order to prevent the immediate risks for fetus and the life expectancy of future generations, we measured aortic intima media thickness by ultrasonography in fetuses of underweight and obese women with low-risk pregnancy.
Method: This was a prospective study performed between January and August 2016. Pregnant women were classified as underweight if their BMI was below 18.5 kg/m^2, according to the IOM 2009 Guidelines; they were classified as low-risk if the estimated fetal weight was between the 10th and 90th percentiles. Abdominal aortic intima media thickness in the distal abdominal aorta were measured in each fetus of underweight women at a mean gestational age of 39 weeks. The same measurements were taken in the fetuses of obese women (BMI >30 kg/m^2).
Results: Thirty-two fetuses of underweight women and 22 fetuses of obese women were consecutively enrolled in the study. Aortic intima media thickness mean values were significantly lower in fetuses of underweight women than in fetuses of obese women (o.68±0.04 mm compared with 1.06±0.16 mm; P<.001). Pre-pregnancy and gestational BMIs of underweight and obese were 16.83 and 21.92 and 32.78 and 37.00, respectively. In addition, wean neonatal birth weight of offspring of underweight women was significantly lower than in fneonates of obese women (3168±122 and 3468±325 g; p<0.001).
Conclusions: Aortic wall thickening in fetuses of underweight women shows differences with respect to those who are obese. In highly industrialized countries, this may reflect a correlation between increasing maternal BMI and early signs of fetal vascular dysfunction, useful to screen for later life atherosclerosis risk.

10.10 PO AN AUDIT OF MACROSOMIA AND MATERNAL CARE FOR EXCESSIVE FETAL GROWTH in CORK UNIVERSITY MATERNITY HOSPITAL

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Background: Macrosomia is defined as a neonatal birth weight (BW) over 4kg and can be associated with perinatal complications. However, Large Fetus (LF) *in utero* is over diagnosed and leads to routine pre-term induced labour or an elective cesarean section (CS). The investigation of the rates of macrosomia, LF diagnosis and perinatal outcomes is therefore hugely important.

Objectives and Methods: *The first objective* of the study was to investigate national CS rates based on the National Perinatal Reporting System (NPRS) reports. *The second objective* was to correlate this with CS rates for women with LF diagnosis recorded on the Hospital In-Patient Enquiry (HIPE) system. *The third objective* was to analyze in depth the delivery route, BW and complication of vaginal birth for 51 women with LF diagnosis in CUMH.

Results: We have demonstrated that an increase in CS rates is not associated with a CS for LF. Based on HIPE data an average neonatal BW for LF was 4.167kg and LF diagnosis has tripled since 2005. In our CUMH cohort babies delivered by CS were significantly heavier than those by vaginal delivery but over 65% of babies delivered by CS were below 4.5kg. Finally, we have observed a higher rate of maternal complications in cases with LF diagnosis.

Discussion and conclusions: The neonatal BW for LF diagnosis was within macrosomic range but LF was over diagnosed. While macrosomia diagnosis can prevent perinatal complications the diagnosis rate and high CS rates for neonates lighter than 4.5kg renders room for future investigation.

10.11 PO WAIST CIRCUMFERENCE, GESTATIONAL DIABETES AND FETAL BIRTHWEIGHT IN PREGNANT WOMEN WITH CLASS III AND IV OBESITY

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Forth Valley Royal Hospital, NHS Forth Valley, Scotland

Objective: Maternal obesity is associated with abnormal fetal growth, and higher incidence of low and high birthweight, as well as an increased risk of gestational diabetes (GDM). There is evidence that both low and high birthweights are associated with disease in later life. The aim of this study was to examine the relationship of booking BMI, waist circumference and biochemical markers of gestational diabetes to predict fetal birthweight in women with severe obesity.

Methods: One hundred and nine women with a BMI≥40 were included. Patient demographics, biochemical and outcome data was collected prospectively. All women were to undertake a GTT according to local protocol. Diagnosis of GDM was in keeping with IADSGP criteria. Fetal birth weight centiles were calculated using a gestation related optimal weight curve provided by the Perinatal Institute. Statistical analysis was performed using Spearman's correlations and two-sample t-test.

Results: Mean booking BMI was 43.9 (3.98) kg/m^2 and waist circumference 120.0 (11.4) cm. Prevalence of GDM was 23.95%. Birth weights ranged from 1140g- 4950g, with a mean of 3409g. Birth centiles ranged from 0.8-100, with a mean birth centile of 47.6. There was correlation between waist circumference and birth centile (R= 0.21). There was a trend for WC to be higher in women who developed GDM (117.8[9.5] vs 124.9[14.8] cm, p=0.10). Booking BMI was significantly higher in those women who developed GDM (42.9[2.5] vs 47.1[5.8] kg/m^2, p=0.003). No correlation was found between BMI or gestational weight gain by 28 weeks and birthweight. There was weak correlation between fasting glucose and birthweight, but no link with 2 hour glucose at GTT or HBA1C.

Conclusion: In severe obesity, booking BMI or gestational diabetes does not predict fetal birth centiles. This is a weak correlation between waist circumference and increased fetal birthweight in pregnant women with BMI >40.

10.11 PO NEONATAL OUTCOME IN TWIN GESTATIONS COMPLICATED WITH SELECTIVE OR NON-SELECTIVE INTRAUTERINE GROWTH RESTRICTION

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Objective: to compare the neonatal outcome in twins affected with selective (sIUGR) or non-selective intrauterine growth restriction (non-sIUGR).
Method: A retrospective analysis of medical records of patients pregnant with twins, hospitalized in 2005-2015, was made. The surveyed group (237 newborns wit IUGR) was divided in four subgroups depending on the number of neonates who met the criteria of IUGR in the pair (birth weight <10th percentile) and chorionicity: 1) one of monochorionic twins affected with IUGR (40 neonates), 2) one of dichorionic twins (85 neonates) 3) both of monochorionic twins (26 neonates) 4) both of dichorionic twins (34 neonates). Neonatal data included gestational age at birth, neonatal mortality, the 1st and 5th minute Apgar score, respiratory support, bronchopulmonary dysplasia, intraventricular hemorrhage, necrotizing enterocolitis, sepsis, pneumonia, length of hospital stay (LOS) and Neonatal Intensive Care Unit (NICU) hospitalisation. P value <.05 was considered significant.
Results: The gestations in the non-sIUGR group lasted longer than in the sIUGR group (averagely 35.69 and 34.79 weeks, respectively; p=0.013).The twins with non-sIUGR, regardless of the chorionicity, were at the increased risk of NICU hospitalization (OR=2.76; 95%IC 1.5-5.2; p<0.01) and pneumonia (OR=2.43; 95%IC 1.1-5.1; p=0.02).
Monochorionic sIUGR twins were at higher risk of need for CPAP (OR 0.25 95%IC 0.08-0.74 p=0.01), mechanical ventillation (OR 0.04 95%IC 0.08-0.92 p=0.04) and the risk of pneumonia (OR=0.13; 95%IC 0.04-0.47; p=0.002) in comparison to non-sIUGR monochorionic twins. Among non-sIUGR twins monochorionic had the extended LOS (p<0.0001) and the increased risk of NICU hospitalisation (OR 0.04 95%IC 0.01-0.16 p<0.0001), mechanical ventillation (OR 0.17 95%IC 0.03-0.9 p=0.04) and pneumonia (OR 0.21 95%IC 0.06-0.79 p=0.02) compared to dichorionic.
Conclusion: Twins with non-sIUGR have worse neonatal outcome than twins with sIUGR.

10.13 PO THE ROLE OF FETAL GROWTH RESTRICTION IN TERM INTRAPARTUM, AND NEONATAL DEATH.

Tamas Marton, Beata Hargitai - West Midlands Perinatal Pathology Department,
Birmingham Women's and Children's Hospital, Birmingham, UK

Objective: According to the ReCoDe classification Fetal Growth Restriction (FGR) was identified in 43% of intrauterine death. One of the most challenging patient groups in perinatal pathology is peripartum (intrapartum and neonatal) death. Our study objective was to establish, what is the role of FGR in peripartum death.
Method: In this retrospective study we identified 105 term stillbirths or neonatal deaths out of 8087 (non-selected) post mortems between 2005-16, 37/40 weeks ≤, with a full post mortem report.
The cases were divided into three groups:
Intrapartum death (IPD) (38 cases), neonatal death with no response to resuscitation (NND no resp) and subsequent death (27 cases) and neonatal death with initial response to resuscitation (NND with resp), but patient deteriorated and subsequently died (40 cases). In this group of patient, the neonates were born with signs of life, resuscitation was commenced, there was response, but later their condition deteriorated and they died in the neonatal period.
FGR was defined body weight (BW) <10th customised centile (WMPI's centile calculator).
Results: IPD: BW <10th centile in 9/38 (23.7%); in 36/38 (95%) there were signs of acute hypoxia and 25/36 (69.4%) had pre-existing hypoxic-ischaemic brain damage (HIE). There were 2 cases with chromosomal abnormality (T18; T21), but no other developmental abnormalities.
NND no resp: 11/27 cases (40.7%) had a genetic condition; of the 16 normally formed babies BW <10th centile in 4/16 (25%); 2 had pre-existing HIE.
NND with resp: 8 cases had genetic condition. Out of the normally developed, only 3 (3/32= 9.4%) had BW <10th centile. 28/32 (87.5%) of the non-genetic cases showed signs of hypoxia.
After exclusion of all developmental abnormalities, the overall presence of FGR in healthy term peripartum death was 15/84 (17.9%).
Conclusion: FGR was significantly less prevalent in our cohort than in intrauterine death (17.9% vs. 43%)

Posters

P 1 BIRTH WEIGHT AND CARDIAC REMODELING ACCORDING TO MATERNAL RESIDENTIAL PROXIMITY TO A MAJOR ROAD

Laura Almeida, Marta Muniesa, Marc Cahuana, Payam Dadvand, Patricia Pagés, Jezid Miranda, Cristina Paules, María Dolores Gómez-Roig
BCNatal - Barcelona Center for Maternal Fetal and Neonatal Medicine (Sant Joan de Déu Hospital Barcelona and Hospital Clinic), Spain.

Objective: To evaluate the association between maternal residential proximity to a major road on birth weight and fetal cardiac remodeling and dysfunction.

Methods: A prospective cohort study including 180 term singleton pregnancies recruited in the fetal medicine department of BCNatal (Sant Joan de Déu Hospital Barcelona and Hospital Clínic) between June 2015 and October 2016. Exclusion criteria: congenital malformations, chromosomal defects, fetal infection or multiple pregnancies. Maternal proximity to a main road was defined as living within 200 meters of that road for at least one year before the pregnancy. The study protocol included structural and functional fetal echocardiography. Echocardiographic measurements: cardio-thoracic ratio, LV base-to-apex length, LV basal diameter, LV sphericity index, septal thickness, right ventricle (RV) base-to-apex length, RV basal diameter, RV sphericity index, mitral ring displacement (MAPSE), tricuspid ring displacement (TAPSE), isovolumetric contraction time (ICT), ejection time (ET), isovolumetric relaxation time (IRT) and myocardial performance index. The growth centile of each baby was calculated by birth weight, gestational age at delivery and sex, according to local curves. Two groups were considered: (1) babies with birth weight < 10^{th} centile and (2) babies with birth weight ≥ 10^{th} centile. Because of multi-level structure of the data (subjects within hospitals), we will develop mix effects models with a hospital random effect to assess the association between maternal proximity to a major road on birth weight and fetal and cardiac remodeling and dysfunction.
Results: The analyses are currently ongoing and the final results being expected to be ready shortly.
Conclusions: Our study is the first to evaluate the effect of maternal residential proximity to major roads on birth weight and fetal and cardiac remodeling and dysfunction. This effect, if confirmed by our study, will have important policy implications.

P 2 PATTERN OF VITAMIN-D LEVELS AMONG PREGNANT WOMEN ATTENDING TERTIARY CARE HOSPITAL, MADURAI

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Velammal Medical College&Research Institute, Madurai, India

Objective: PRIMARY:To study the vitamin-D levels among pregnant women in a tertiary care hospital, Madurai.
Method: Study design: cross sectional study Study duration: Over a period of 3 months between March 2017- May 2017 Study setting & study population:
Convenient sampling of 40 pregnant women visiting VMCH Obstetrics & Gynaecology OPD irrespective of gestational age were included in this study after obtaining Institutional Ethical clearance and informed written consent.
Data collection method: After collecting 1ml venous blood from the subjects, serum vitamin-D3 level was found using the Vitamin-D kit in which the tests were performed in Vitros-CLIA machine.

Results:

Pregnancy	Serum vitamin D3		Total
	Deficiency	Normal	
Abnormal	9	14	23
Normal	5	12	17
Total	14	26	40

Chi-square value: 0.406; P-value: 0.524

Conclusion: Out of 40 pregnant women, 17 women had normal pregnancy while 23 women had abnormal pregnancy. As per the significance value (P>0.05), there is no statistical association between serum vitamin D3 levels and pregnancy status.

P 3 COMPARISON OF GROW AND WHO BIRTH WEIGHT CENTILE AND ITS IMPACT ON OUR NEONATAL SERVICES

K Ashraf, R Agrawal, S Bullough, D Ennis, F Adeniyi, L Eleanor, R Myagerimath, S. Mwenechanya, S Babarao
Wirral University teaching Hospital.

Objective:

- To monitor compliance with the GAP protocol within the trust.
- To compare the estimated fetal weight (EFW) on customized growth charts and WHO birth weight centile for small for gestational age (SGA) babies.
- To monitor the compliance to trust hypoglycemia pathway for SGA babies.

Method: It was a retrospective audit of all SGA babies conducted between December 2016 to April 2017. Cases were identified from centile charts generated at birth. Data was collected from GROW centile charts and clinical notes.
Results: The total numbers of SGA babies born during this period were 97; maternal case notes were available for 80 cases. The overall incidence of SGA was 97/1291 (7.5%). SGA detection was 50/97 (51.5%). Among the 80 cases our compliance with generating growth charts was 100%. Although 47 babies were undetected SGA, we could only find notes for 38 cases. Out of the 38 missed cases there were 7/38 (18%) who did not have growth scans even though they met the criteria. Fundal heights were not plotted in 8/38 cases (21%) and were plotted incorrectly in 12/30 cases (40%). Neonatal case notes were available for 91 out of 97 SGA babies. Only 83 included in the audit. As per trust hypoglycaemia pathway 43 babies were appropriately managed. Additional 40 went on hypoglycaemia pathway as per Grow birth weight centile< 10th, out of which only one baby need admission to neonatal unit.
Conclusions:

- Pick up rate for SGA has improved from 47 to 51.3%.
- We were 100% compliant in generating the growth charts; however training issues with fundal height plotting and scanning were identified.
- Although risk stratification at booking was good, appropriate measures were not taken in 18%.
- By following GROW birth weight centile < 10^{th} for hypoglycaemia pathway we doubled our neonatal workload.

P 4 DECREASED BIRTH WEIGHT IN RELATION TO MATERNAL EXPOSURE TO TRIHALOMETHANES (THM) IN DRINKING WATER DURING PREGNANCY

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[1]BCNatal. Barcelona Center for Maternal Fetal and Neonatal Medicine. [2]ISGlobal. Barcelona Institute for Global Health. Spain.

Background: Previous studies have investigated the relationship between disinfection by-products in water and fetal growth without finding clear evidence.
Objective: To investigate the relationship between exposure to THM in drinking water during pregnancy and birth weight.
Method: Cohorts prospective multicentric study. A total number of 689 women were recruited at 20 weeks of gestation between April 2015 and May 2017 in Sant Joan de Déu Barcelona Hospital and Hospital Clínic Barcelona. Exposure to THM during pregnancy was estimated by the residence of patients. Municipality and postal code were linked to the last THM levels modelled in the Barcelona metropolitan area in a previous study (year 2010). Two outcomes were used to measure fetal growth: intrauterine growth restriction (IUGR) and growth percentile according to birth weight, gestational age at delivery and sex.
Results: A total of 278 women from initial cohort were IUGR babies. The median of growth percentile in IUGR babies and normoweight babies was 2 and 39 respectively. THM levels vary from 8 to 114 µg/L of water and were divided in quartiles (<50, >50-89, >89-100, >100 ug/L). Women exposed to the highest quartile of THM levels (>100 µg/L) compared to those with lowest level (<50 µg/L) had an OR of 1.92 (IC 95%: 1.24, 2.98) (p=0.004) to have a baby with IUGR. Once we adjust them by hospital the OR is 1.17 (IC 95%: 0.71, 1.91)(p=0.53). Analysing the relation between growth percentile and THM level, we found a negative significant relation (B=-3.4, IC95%:-5.3,-1.4) (p=0.01) but it became no significant when we adjust them by hospital.
Conclusion: We found no association between fetal growth and THM exposure levels in our study. Possible confounding variables will be considered in the future, like smoking and socioeconomic level. More research is needed to make recommendations about water habits in pregnant women.

P 5 FETAL GROWTH RESTRICTION WITH POLYHYDRAMNIOS: STILL AN OMINOUS SIGN

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Background: It is advised to perform fetal karyotyping and detailed ultrasound evaluation when the coincidence of growth restriction with polyhydramnios is observed as the published data suggest high incidence of fetal abnormalities Case presentation: 33-year old primigravida in the 31th week of pregnancy was referred to our unit with FGR (EFW on the 5th percentile), reduced fetal movements and polyhydramnios (AFI 29). Ultrasound examination revealed no congenital malformations with visible stomach and normal Doppler examination. Amniocentesis due to high risk of trisomy after the first trimester combined screening revealed normal male karyotype. Due to maternal discomfort an amnioreduction of 950 and 1000 ml of clear amniotic fluid was performed twice. On cardiotocography repeatedly a non-reactive pattern with normal STV was observed. Biophysical profile and Doppler examination was performed with reassuring results and therefore decision to continue the pregnancy was made. Nevertheless, in the 32nd week of gestation PPROM with leakage of blood-stained amniotic fluid was observed and due to suspected fetal distress cesarean section was performed. A male newborn weighing 1350 grams with Apgar score 6 was born with normal heart rate, but hypotonic and non-reactive. Due to lack of respiratory drive he was intubated in the 8th minute of life and required respiratory support. Muscular hypotonia, cryptorchidism and dysmorphic features (large skull, long fingers) with normal CNS MRI suggested genetic disorder and, after excluding SMA, muscle biopsy was performed. Histopathological examination confirmed myotubular myopathy, which is an X-linked disorder with a dismal prognosis. **Conclusion:** In the light of our case even with favorable results of prenatal diagnostics the prognosis may by serious. Multiple genetic disorders might manifest as FGR with polyhydramnios but a proper diagnosis usually cannot be established before the delivery. A thorough examination of the newborn, including genetic tests and even a tissue biopsy may be necessary.

P 6 FETAL GROWTH RESTRICTION – IS IT A PREVENTABLE RISK FACTOR FOR PERINATAL MORTALITY

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[1.]City Hospital, Birmingham, UK [2.]University Hospital of North Midlands NHS Trust

Objective: The aim of this retrospective study was to review the notes of singleton pregnancies with fetal growth restriction among the cases with antepartum still birth or early neonatal death for a period of 36 moths at City Hospital, Birmingham. The objective was to find any preventable factor.
Method: We reviewed the database of perinatal mortality of 36 months (June 2014 to December 2016) and identified 14 cases of fetal growth restriction. We reviewed the notes from the departmental database and the presentations of the perinatal mortality review meetings. The multiple pregnancy and fetuses with lethal abnormality are excluded
Results: The range of age of the women was 26-39 years. The women were from different ethnic background. Smoking and substance misuse was identified in 2 cases. Preeclampsia was associated with 4 cases. All cases were delivered at term apart from 4 cases who delivered between 27 and 34 weeks. In 2 cases early delivery and in 1 case more frequent fetal monitoring might have avoided the outcome.
Conclusion: Early detection and timely delivery of growth restricted fetuses is the key to improve the perinatal mortality

P 7 INNOVATIVE SERVICE IMPROVEMENT PACKAGE TO IMPROVE THE CARE OF WOMEN PRESENTING WITH REDUCED FETAL MOVEMENTS

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Sheffield Teaching Hospitals NHS Trust UK

Objective: To improve access, consistency and management of women with reduced fetal movements (RFM) and increase staff and public awareness locally.
Method: Innovative Implementation package with potential for spread at scale has been adopted. This is fully funded following a successful bid to the NHS England 'Maternity and Neonatal Innovation Fund'. The project requires challenging existing care pathways and ingrained practice therefore a clear project plan is further enhanced by use of the COM-B model to support behavior change [1].
Methods also include:
- Appointing a Movement Matters Midwife to lead project
- Agreeing and implementing new care pathway
- Developing a rapid access pathway for women
- Staff workshop using Forum Theatre
- Learning package for staff
- Revised information for women and families in variety of formats.

Results: Project is currently on-going, data to be presented will include: **Baseline data collection**: number of calls / attendances from antenatal women about RFM, audit of waiting times from arrival to review, number of stillbirth where RFM was reported, audit of women's knowledge, audit of staff knowledge and management of RFM. **Attendance** at Forum theatre production and its evaluation. **Completion of learning package**, including pre and post learning evaluation. **Reach**: multi-agency spread of innovative pathway **Compliance** with pathway: audit of records. **Feedback** from staff: facilitation of 'You said' 'we did' in response to staff feedback. **Re-audit** following implementation: repeat of baseline data.

Reference [1] Michie S, Stralen M, West R (2011) The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implementation Science, 6:4

P 8 EMERGENCY CESAREAN BIRTH IN TERM PREGNANCY – POSSIBLE ASSOCIATION WITH UNDIAGNOSED LATE FETAL GROWTH RESTRICTION

Tânia Meneses, Catarina Palma Reis, Natacha Oliveira, Bruno Carrilho, Ana Teresa Martins
Dr. Alfredo da Costa Maternity, Lisbon, Portugal

Objective: Emergent cesarean section is a surgical act associated with high morbidity. Early identification of fetuses at risk for hypoxia in labor can facilitate a prompt and safer delivery.
Method: We conducted a retrospective study of clinical records regarding term cesarean births classified as emergent, from January to December 2015. We analysed maternal age, gestational age at birth, medical problems during pregnancy, cesarean birth indication, prenatal diagnosis of fetal pathology, birth weight, admission to Neonatal Intensive Care Unit (NICU) and length of stay.
Results: Our sample included 39 term cesarean births classified as emergent. Median maternal age was 31,2 years. In 28,2% of cases there were maternal medical problems diagnosed during pregnancy – the most frequent being hypertensive disorders (n=7) and gestational diabetes (n=2). Indication for emergent caesarean section was more frequently non-reassuring fetal status (47,4%), followed by prolonged fetal bradycardia (39,5%) and suspected placental abruption (10,5%). There were 5 cases of antenatally diagnosed fetal disorders, of which only one case was fetal growth restriction (FGR). By analysing birth weight compared to locally used charts, we identified another 13 cases of small-for-gestational-age fetuses (35,9%), previously undiagnosed. 12.8% of all newborns were admitted to NICU, with an average length of stay of 7,6 days.
Conclusions: Although limited by small sample size, the findings of this study echo the existing literature. The high incidence of small-for-gestational-age fetuses in emergent cesarean births suggests an underdiagnosis of late fetal growth restriction cases. Fetal Doppler evaluation could help predict which foetuses are at risk for hypoxia during labor, thus avoiding emergent cesarean section.

P 9 GESTATIONAL AGE AND ABNORMAL DOPPLER EVALUATION AT DIAGNOSIS OF FETAL GROWTH RESTRICTION

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Objective: Doppler ultrasound helps improve the management of Fetal Growth Restriction cases, independently of gestational age. Our goal was to study the gestational age at diagnosis of FGR, and the fetal doppler at that ultrasound evaluation.
Method: We conducted a prospective observational study since the foundation of a dedicated FGR Unit - July 2016 to June 2017. We included singleton gestations diagnosed and delivered in our center, and excluded fetal anomalies and chromosomal abnormalities. FGR was defined as an estimated fetal weight and/or abdominal circumference < 10th centile. Cases diagnosed before 32 weeks were considered early-onset FGR, and after that, late FGR. We analysed gestational age at diagnosis; type of FGR and fetal Doppler evaluation at diagnosis. Data was obtained by consulting Astraia® and clinical files.
Results: Our cohort included 111 cases. Early- and Late-FGR accounted for 60 (54,1%) and 51 (45,9%) cases, respectively. Mean gestational age at diagnosis was 29,59 weeks for early-FGR and 34,16 for late-FGR. Umbilical blood flow was abnormal (PI > 95th centile) in 24,5% of early-onset and 12,0% of late-onset FGR. There were 4 records of UA absent or reversed end-diastolic flow at diagnosis, all in the Early-FGR group. CPR below the 5th centile was found in 18,3% of EFGR cases, and in 26,5% of LFGR cases.
Conclusions: In our center, the mean gestational age at diagnosis of early- and late-FGR is 29,59 and 34,16 weeks, respectively. Our elevated rate of EFGR may be due to being a tertiary perinatal center and the timing of routine prenatal care in Portugal. Early FGR was associated with pathological Umbilical Artery Doppler evaluation (consequence of increased resistence to placental bloodflow), whereas late FGR had higher rates of abnormal Cerebro-Placental Ratio values, reflecting brain-sparing.

P 10 INDICATION AND MODE OF DELIVERY IN EARLY FETAL GROWTH RESTRICTION (EFGR)

Catarina Palma Reis, Tânia Meneses, Natacha Oliveira, Bruno Carrilho, Ana Teresa Martins
Maternidade Dr. Alfredo da Costa, Lisbon, Portugal

Objectives: Our goal was to study the indications and mode of delivery in early FGR
Methods: We conducted a prospective observational study since the foundation of a dedicated FGR Unit from July 2016 to June 2017. We included singleton gestations diagnosed and delivered in our center, and excluded fetal anomalies, chromosomal abnormalities and fetal deaths prior to delivery. FGR was defined as an estimated fetal weight and/or abdominal circumference < 10th centile. Cases diagnosed before 32 weeks were considered early-onset FGR. Analysed data included gestational age (GA) at birth; primary indication and mode of delivery; fetal Doppler status on the last ultrasound; newborn apgar score and admission to the intensive care unit (ICU); and neonatal deaths. Data was obtained from Astraia® and clinical files.
Results: We analysed 59 deliveries. Mean GA at delivery was 35,71w. 37,3% of women underwent elective or emergent caesarean delivery before the onset of labour. 18,6% had a spontaneous onset of labour and labour was induced in 26 cases (44,1%), mainly for fetal Doppler alterations (80,9%), GA of 38 weeks (11,5%) and growth arrest (3,8%).
47,6% had a vaginal delivery (37,3% eutocic, 3,5% breech and 6,8% dystocic); Caesarean section rate was 52,4% (33,9% elective; 8,5% in labour; 10% emergent).
Concerning the newborns, 8 (13,5%) had a 5th minute Apgar score < =7. From the 53% admited to the ICU, one had an early neonatal death (ENND) from pulmonar hypoplasia and one had a late NND (LNND) due to sepsis.
Conclusions: In our center, mean GA at delivery for EFGR fetuses was 35,71 weeks. Labour was induced in 44,1% of patients mainly for fetal doppler alterations (83,9%). Emergent cesarean section rate was 10%. More than half the newborns were admited to the ICU (53%), and two of them died in the neonatal period (3,4%).

P 11 INDICATION AND MODE OF DELIVERY IN LATE FETAL GROWTH RESTRICTION (LFGR)

Catarina Palma Reis, Tânia Meneses, Natacha Oliveira, Bruno Carrilho, Ana Teresa Martins
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Objectives: Our goal was to study the indications and mode of delivery of LFGR.
Methods: We conducted a prospective observational study since the foundation of a dedicated FGR Unit, from 01/07/2016 to 30/06/2017. We included singleton gestations diagnosed and delivered in our center, and excluded fetal anomalies, chromosomal abnormalities and fetal deaths prior to delivery. FGR was defined as an estimated fetal weight and/or abdominal circumference < 10th centile. Cases diagnosed after 32w were considered late-onset FGR. Analysed data included gestational age (GA) at birth; primary indication and mode of delivery; fetal Doppler status on the last ultrasound; Newborn 5th minute Apgar score (AS5'), admission to the intensive care unit (ICU) and deaths (NND). Data was obtained from Astraia® and clinical files.
Results: We analysed 51 deliveries. Overall, mean GA at delivery was 38,14w. Regarding the onset of labour, 17,6% of women underwent elective caesarean section. 13 had a spontaneous onset of labour (25,5%) and labour was induced in 29 cases (56,9%), mainly for GA of 38w (75,9%) fetal doppler alterations (20,7%) and oligoamnios (3,4%).
A vaginal delivery occurred in 62,7% of cases (49% eutocic and 13,7% dystocic deliveries). Cesarean section rate was 37,3% (27,5% elective; 7,8 % in labour and 2% emergent).
33% of fetuses had a normal Doppler evaluation. In this subgroup, vaginal delivery rate was 65% and emergent caesarean rate was 0%.
2 newborns (3,9%) had an Apgar score in the 5th minute<=7. 10 % were admited to the ICU with 0 NND.
Conclusions: Mean GA at delivery for LFGR fetuses was 38,14w. Labour was induced in the majority of women (48,5%) mainly for GA 38w (62,6%). Cesarean section rate was 36,4%. In the subgroup of patients without Doppler abnormalities, vaginal delivery rate was higher (65%) and emergent cesarean section rate was lower (0%).

P 12 LAST DOPPLER EVALUATION PRIOR TO BIRTH AND MODE OF DELIVERY

Tânia Meneses, Catarina Palma Reis, Natacha Oliveira, Bruno Carrilho, Ana Teresa Martins
Dr. Alfredo da Costa Maternity, Lisbon, Portugal

Objective: Doppler ultrasound in growth-restricted fetuses helps predict hypoxic complications during labor and delivery. Our goal was to study the relation between the last Doppler evaluation before birth and mode of delivery.
Method: We conducted a prospective observational study since the foundation of a dedicated FGR Unit - July 2016 to June 2017. We included singleton gestations diagnosed and delivered in our center, and excluded fetal anomalies and chromosomal abnormalities. FGR was defined as an estimated fetal weight and/or abdominal circumference < 10th centile. We analysed the last fetal Doppler evaluation prior to delivery, gestational age at delivery and mode of delivery. Data was obtained by consulting Astraia® and clinical files.
Results: Our cohort included 111 cases. Early- and Late-FGR accounted for 60 (54,1%) and 51 (45,9%) cases, respectively. Last doppler prior to delivery was normal in 50 cases, with a mean gestational age of 37,6 weeks at delivery and a vaginal birth rate of 60%. Isolated UA PI > 95th centile was associated with similar gestational age at delivery and vaginal birth rate (37,3 weeks and 61%). Evidence of brain-sparing (MCA or CPR below 5th centile) was verified in 38 cases, with delivery occurring in average at 35,5 weeks. In this group, vaginal birth occurred in 50%, with emergent C-section accounting for 8% of deliveries. Absent or inverted UA end-diastolic flow and pathological DV were associated with birth at a mean of 30,3 and 28,9 weeks, respectively. In this combined group only 33% of patients had a vaginal birth.
Conclusions: In our study, worsening Doppler findings in growth-restricted fetuses were associated with earlier gestational age at birth and lower rates of vaginal birth.

P 13 THE DETECTION RATE OF SMALL FOR GESTATIONAL AGE (SGA) BABIES AND INTRAPARTUM OUTCOMES- IS THERE ROOM FOR IMPROVEMENT?

Mittal Patel, Atef El-Matary Darent Valley Hospital, Dartford, United Kingdom.

Objective:

- To asses our detection rate of SFGA babies since introduction of customised growth charts in the trust.
- To ascertain whether patients are correctly identified with SGA baby
- To determine if the correct antenatal care plan is followed with regular growth scans and review
- To assess if SGA babies are at higher risk of iatrogenic or interventional delivery during induction of labour

Method: Retrospective review of notes for 51 babies with birthweight <10th centile on customised growth chart between February to September 2016. Exclusions: twins, care at a different trust, no notes, congenital anomalies

Results:

- Mean age 28 years, BMI 24.5
- Most common risk factors: Nulliparity (43%), smoker >11/day (25%), previous IUGR (14%)
- 27% SGA detected clinically through measurements, 22% detected with slow or static growth
- Improvement in SGA detection to 80% (50% prior to GROW programme)
- 8/17 women having serial ultrasound scans had abnormal dopplers
- Deliveries: 23 inductions of labour (2 RROM); 66.7% achieved a vaginal birth; 33.3% (17) had a caesarean birth → 58% (10) due to CTG abnormalities with 5 abnormal antenatal CTGs.
- 3 babies were admitted to SCBU
- 4 cases were identified showing missed opportunities in care including incomplete assessment, inaccurate scan report and interpretation

Conclusions:

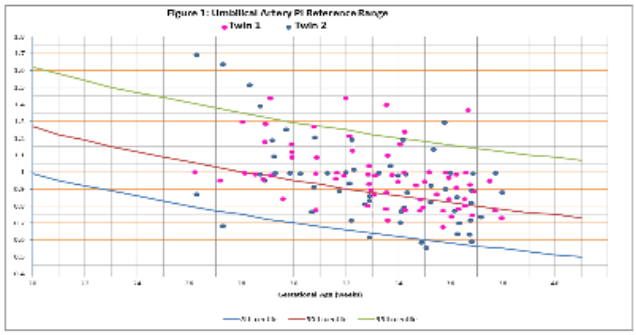
- All women are having some form of risk assessment
- Not all women have an accurate risk assessment and appropriate care plan
- Scans are requested but not necessarily correctly reviewed. Should we train all staff to review scans?

P 14 Withdrawn

P 15 INCREASED IMPEDANCE INDICES ARE SEEN IN THE UMBILICAL ARTERIES OF TWIN FETUSES IN COMPARISON TO A SINGLETON FETUS: A FACT OR A MYTH!

Sucheta Jindal United Lincolnshire Hospitals NHS Trust, UK

Objective: Association between the fetal chorionicity and the fetal outcome is well recognised. In contrast to this, the views of various observational studies and controlled trials are very conflicting with respect to the doppler assessment of the twin fetuses. We aim to establish the fact whether it is a fact or a myth that there is a trend towards increased umbilical artery pulsatility index (UAPI) in the twin fetuses when compared to the singleton pregnancies.
Method: Retrospective analysis of 18 twin pregnancies who delivered in our hospital over the period of three years. The UAPI of each twin fetus was plotted on a graph (Figure 1) created using the reference ranges for serial measurements of umbilical artery doppler indices in the second half of pregnancy as stated in the study performed by Acharya G et al. (Reference: Am J Obstet Gynecol.2005; 192:937-44)
Results: Amongst 18 pregnancies, 15 were dichorionic diamniotic (DCDA) and 3 were monochorionic diamniotic (MCDA) twins. These pregnancies were monitored by ultrasound in the third trimester according to the national guidelines with scan frequency of 3 to 4 weekly in DCDA and 2 weekly in MCDA twins. Both fetuses in all 3 MCDA twin pregnancy had higher than 50th centile UAPI in every growth scan assessment. Both fetuses in 1 (associated with pre eclampsia) and only one fetus in 2 DCDA twin pregnancy had increased to abnormal UAPI. It is evident from Figure 1 that the majority of the UAPI in both the twin fetuses was plotted around the 50th centile of the reference range as seen in the singleton pregnancy.



Conclusions: It is in fact "A Myth" to believe that all twin fetuses have increased impedance indices to the flow of umbilical artery in comparison to singleton fetus. Hence the principles of umbilical artery waveform assessment are similar in DCDA twin pregnancies and singleton pregnancies for fetal surveillance in third trimester.

P 16 RELATIONSHIP BETWEEN GESTATIONAL WEIGHT GAIN AND PREGNANCY COMPLICATIONS IN PREGNANT WOMEN WITH EXCESSIVE WEIGHT.

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Objective: To investigate the relationship between gestational weight gain (GWG) and pregnancy complications in pregnant women with excessive weight.
Method: A retrospective study of 197 women with pre-gravid body mass index (BMI) ≥25 giving birth≥36 weeks of gestation in 2016-2017 was conducted. They were divided into 2 groups: group 1 - with adequate or inadequate and group 2 - with excessive GWG. Pregnancy complications including gestational diabetes mellitus (GDM), gestational hypertension (GH), preeclampsia (PE), intrahepatic cholestasis of pregnancy (ICP), the mode of delivery and newborns' birthweight were compared between the groups.
Results: The majority of women had excessive GWG during pregnancy (108 patients, 54.8%). There were no differences in the occurrence of pregnancy complications between the groups. Women from group 2 had significantly more often caesarean delivery. Excessive GWG was associated with significantly higher neonatal birthweight (p=0.003), higher incidence of LGA (0.01), while the rates of SGA did not differ between the groups.
Conclusions: Excessive GWG is a risk factor of caesarean delivery and LGA in women with BMI≥25.

	Group 1 n=89	**Group 2 n=108**	**p**
GDM	16 (18 %)	18 (16.7%)	0.8
GH	11 (12.4%)	18 (16.7%)	0.4
PE	2 (2.2%)	2 (1.9%)	1
ICP	3 (3.4%)	0 (0%)	0.09
Caesarean delivery	**43 (48,3%)**	**73 (67,6%)**	**0.009**
Blood loss	476 ± 206	524 ± 205	0.09
Birthweight	**3406 ± 521**	**3627 ± 519**	**0.003**
SGA	5 (5.6%)	4 (3.7%)	0.7
LGA	**11 (12.4%)**	**29 (26.9%)**	**0.01**

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