8th International Conference on Fetal Growth

Berlin 2019

Programme and Abstracts

8th International Conference on Fetal Growth

Berlin, 9-11 October 2019

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GENERAL INFORMATION

Website: fetalgrowth.org

Venue: Maritim proArte Hotel
Friedrichstraße 151, 10117 Berlin
Tel +49 30 20335

Admission to the conference is with name tag only. In the interest of safety, please make sure it is visible at all times.

Welcome Reception
Wednesday 6 - 8pm
'Checkpoint' Bar

Gala Dinner & Dance
Thursday eve, 8 to late
Dress: smart- casual

Berlin Festival of Lights
https://festival-of-lights.de
Friday 7pm: guided walk

Willkommen,
Bienvenue,
Welcome!

A warm welcome from the Scientific Committee of the 8th International Conference on Fetal Growth.

Since its inception, this annual, specialised conference has tracked developments in research, clinical practice and guidelines on fetal growth. The contents of the programme are to a large extent shaped by work submitted by delegates, and once again there has been an abundance of quality abstracts.

The meeting provides a good forum to present and critically examine the latest evidence, in the usual format of a single stream of oral presentations including e-posters selected for short communication, interspersed with ample time for discussion.

As every year, we aim to balance the scientific pursuit with a fitting social programme, which will include the Welcome Reception on Wednesday evening, Thursday night's Dinner featuring an excellent local band guaranteed to get you dancing, and Friday evening an opportunity to see some artistically illuminated landmark buildings, marking the start of Berlin's famous annual Festival of Lights.

We hope you enjoy Fetal Growth 2019!

Jason Gardosi
Professor and Director
Perinatal Institute, Birmingham, UK

Birgit Arabin
Professor and Director
Clara Angela Foundation, Berlin, Germany

Stefan Verlohren
Senior Obstetric Consultant
Charite University, Berlin, Germany

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

Lesley McCowan
Professor of Obstetrics and Gynecology
University of Auckland, New Zealand

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

WEDNESDAY 9th OCTOBER

Pre-Conference Workshops

WORKSHOP 1: Fetal Growth Assessment

AM	**Screening & Surveillance** Prof Jason Gardosi & Mandy Williams - Perinatal Institute, UK Joyce Cowan & Clare Barrett - Perinatal Institute, New Zealand
09:00	• Evidence based risk assessment • Standardised measurement
10:30	Refreshment Break
11:00	• Customised growth charts • Audit tools; quality assurance
12:30	Lunch
PM	**Ultrasound & Doppler** Prof Francesc Figueras – University of Barcelona, Spain Prof Ahmet Baschat – Johns Hopkins University, USA Prof Torvid Kiserud – University of Bergen, Norway
13:30	• Ultrasound biometry • Liquor, biophysical profile
15:00	Refreshment Break
15:30	• Doppler parameters – basic • Doppler parameters – advanced
17:00	Close

WORKSHOP 2 - für Hebammen

Individuelle Wachstumskurven (GROW)
und das Growth Assessment Protocol (GAP)

13:30	• Einflüsse individueller Merkmale auf fetales Wachstum • Screeningmöglichkeiten: äußere Untersuchungen und Messungen
15:00	Refreshment Break
15:30	• Anwendung des GAP-Tools in der Praxis; Qualitätssicherung • Implementierungsmöglichkeiten in Deutschland
17:00	Close
18:00 - 20:00	**Welcome Reception - 'Checkpoint' Bar**

THURSDAY 10th OCTOBER

Conference Day 1

K Keynote 15+5 min | O Oral 7+3 min | PO Poster Oral 2+1 min | D Panel

08:00 Registration

09:00 **Welcome**

09:10 **SESSION 1: Intrauterine growth: outcomes for mother and infant**

09:10 K **BIRGIT ARABIN**
1.1 | Effect of pregnancy with growth disorders on long-term health of mothers and offspring

09:30 O **KASIA MAKSYM**
1.2 | Maternal stress, anxiety and depression in severe fetal growth restriction

09:40 O **AHMET BASCHAT**
1.3 | Transition to neonatal life in the growth restricted fetus – what do we need to tell our neonatalology colleagues?

09:50 O **GERNOT DESOYE**
1.4 | A reduction in sedentary behaviour in obese women reduces neonatal adiposity: the Dali randomized trial

10:00 O **JEZID MIRANDA**
1.5 | SGA and LGA newborns have increased mortality risk during the first year of life: a cohort analysis of 10 years of live births in the USA

10:10 PO **PRADEEP ALUR**
PO 1 | Sex differences in transition phase of nutrition in ELBW infants

10:13 PO **EDURNE MAZARICO**
PO 2 | Neonatal mortality and morbidity of extreme premature neonates with growth restriction

10:16 D **PANEL**
How can we reduce adverse outcome for mothers and infants?

10:20 Refreshment Break

10:40 **SESSION 2: Associations and risk factors**

10:40 O **LESLEY MCCOWAN**
2.1 | Folic acid supplementation is associated with size at birth in the screening for pregnancy endpoints study

10:50 O **LYNN SADLER**
2.2 | How might smoking help us to understand the causes of fetal growth restriction

11:00 PO **HELEN BASTON**
PO 3 | Engaging pregnant smokers with smoking cessation services: offering carbon monoxide self-monitoring

11:03 O **MARIA DOLORES GOMEZ ROIG**
2.3 | Heavy metal levels in placenta in fetuses with FGR and AGA

11:13 O **JEZID MIRANDA**
2.4 | Human fetal growth restriction is influenced mainly by maternal socioeconomic status: an ecological study within a city from a developing country

11:23 PO **CATARINA PALMA DOS REIS**
PO 4 | Outcomes of fetal growth restriction: does maternal age matter?

11:26 D **PANEL**
Risk factors: screening and prevention

THURSDAY 10th OCTOBER

Conference Day 1 (continued)

K Keynote 15+5 min | O Oral 7+3 min | PO Poster Oral 2+1 min | D Panel

11:40 SESSION 3: Diabetes in Pregnancy

11:40 K **SURESH SESHADRI**
3.1 | Diabetes and fetal growth: pre-gestational and GDM; role of diabetic control; roles and limitations of Doppler

12:00 O **TORVID KISERUD**
3.2 | Diabetes mellitus: pathophysiological background for increased risk of fetal demise in late pregnancy

12:10 PO **TAMAL DATTA**
PO 5 | Outcome of large for gestational age fetuses in non-diabetic mothers

12:13 PO **TRACY TOMLINSON**
PO 6 | Beyond carbohydrates: the association between fat consumption and fetal overgrowth with type 1 diabetes

12:16 D **PANEL**
Diabetes and fetal growth

12:40 Lunch

13:30 SESSION 4: Fetal growth, size and standards for measurement

13:30 O **FRANCESC FIGUERAS**
4.1 | Fetal size vs growth in predicting outcome

13:40 O **TORVID KISERUD**
4.2 | Physiological fetal growth retardation; the WHO fetal growth study

13:50 O **JASON GARDOSI**
4.3 | Slow growth defined by customised growth trajectory and adverse perinatal outcome

14:00 D **PANEL**
Shall we primarily rely on fetal size or fetal growth?

14:20 O **LESLEY MCCOWAN**
4.4 | Risk of stillbirth at term associated with small and large for gestational age by customised, WHO and IG-21 birthweight centiles

14:30 O **JEZID MIRANDA**
4.5 | Intergrowth-21 vs WHO fetal growth charts for the identification of SGA in a population from Latin America

14:40 O **ANNA KAJDY**
4.6 | Comparison of population vs customised birthweight charts in Poland for the prediction of neonatal outcome

14:50 O **URSZULA SARZYNSKA-NOWACKA**
4.7 | Predictive accuracy of customised vs populational twin growth chart for adverse perinatal outcome: a cohort study

15:00 PO **OLIVER HUGH**
PO 7 | Perinatal mortality and SGA rate according to Hadlock and customised fetal weight standards in a South Asian population

THURSDAY 10th OCTOBER

Conference Day 1 (continued)

O Oral 7+3 min | PO Poster Oral 2+1 min | D Panel

15:03 PO **OLIVER HUGH**
PO 8 | Customised vs population based fetal weight standards to define small for gestational age at 22 weeks gestation

15:06 PO **JUDIT MARTINEZ**
PO 9 | Accuracy of Hadlock and Intergrowth formulae for birthweight in pregnancies with suspected late IUGR

15:09 PO **MARTA RIAL-CRESTELO**
PO 24 | Prescriptive reference standards of third-trimester cerebroplacental ratio and its physiological

15:12 D **PANEL**
Which standards should be used?

15:40 Refreshment Break

16:00 SESSION 5: Antenatal detection of FGR: current strategies

16:00 O **GABRIJELA BRZAN SIMENC**
5.1 | Small for gestational age neonate: what is the benefit of antenatal detection?

16:10 O **GLENN GARDENER**
5.2 | Improving the detection of fetal growth restriction: evaluation of user experience of an interactive educational program

16:20 O **KRISTEN GIBBONS**
5.3 | Investigating the utility of the customised fetal growth chart: a randomised controlled trial

16:30 O **JASON GARDOSI**
5.4 | Improved detection of SGA and reduction of stillbirths in England

16:40 O **OLIVER HUGH**
5.5 | Effect of serial scanning in high risk pregnancy on risk of stillbirth

16:50 O **NUZHAT AZIZ**
5.6 | Implementing comprehensive fetal growth surveillance: GAP India

17:00 O **JOYCE COWAN**
5.7 | Growth Assessment Protocol (GAP) increased detection of small for gestational age babies and reduced neonatal morbidity at New Zealand tertiary maternity hospital

17:10 O **ROBIN HUGHES**
5.8 | GAP protocol – reducing stillbirths through improved identification of FGR – the Hull experience

17:20 PO **POSTER ORALS 10 to 21**
Abstracts pages 45 - 50

18:00 Close

20:00 Gala Dinner and Dance

FRIDAY 11th OCTOBER

Conference Day 2

K Keynote 15+5 min | O Oral 7+3 min | PO Poster Oral 2+1 min | D Panel

07:30 Registration

08:30 **Welcome**

08:40 **SESSION 6: Hypertension, fetal growth and markers of angiogenesis**

08:40 K
ROGER NEWMAN
6.1 | Fetal size in hypertensive pregnancy: the NIH studies

09:00 O
LISA DRÖGE
6.2 | Placental weight in preeclamptic and growth-restricted pregnancies in correlation to the maternal sFlt-1/PlGF serum concentration and doppler findings

09:10 O
MAREK LUBUSKY
6.3 | Maternal serum levels of sFlt-1 & PlGF in a low-risk population of predicting pre-eclampsia, fetal growth restriction and newborn SGA

09:20 O
MANEL MENDOZA
6.4 | Maternal and perinatal outcomes in growth restricted fetuses with extremely high sFlt/PlGF ratio

09:30 O
MANEL MENDOZA
6.5 | Prediction of elective delivery in SGA and FGR

09:40 PO
MAGDALENA BEDNAREK-JĘDRZEJEK
PO 22 | Angiogenesis markers in ultrasound-confirmed late-onset fetal growth restriction, and their utility in determining neonatal outcome

09:43 PO
TANIA MENESES
PO 23 | sFlt-1/PlGF ratio in early vs late onset FGR

09:46 D
PANEL
Role of markers in screening and surveillance

10:00 Refreshment Break

10:20 **SESSION 7: Ultrasound & Doppler: new insights for management**

10:20 K
AHMET BASCHAT
7.1 | Planning surveillance intervals and timing delivery in early onset IUGR

10:40 K
FRANCESC FIGUERAS
7.2 | Planning surveillance intervals and timing delivery in late onset IUGR

11:00 PO
ANDREW SHARP
PO 25 | Pregnancy outcomes with raised umbilical artery doppler pulsatility index identified before 32 weeks gestation

FRIDAY 11th OCTOBER

Conference Day 2 (continued)

K Keynote 15+5 min | O Oral 7+3 min | PO Poster Oral 2+1 min | D Panel

11:03 O **JOSE MORALES ROSELLO**
7.3 | Outcome predictors of spontaneous and induced labour in fetuses examined up to 34 weeks: a multivariable analysis study

11:13 O **TRACY TOMLINSON**
7.4 | Prediction of severe adverse perinatal outcomes in pregnancies complicated by fetal growth restriction

11:23 K **GIUSEPPE RIZZO**
7.5 | Umbilical vein flow predicts adverse perinatal outcome in late fetal growth restriction

11:43 K **GREGGORY DEVORE**
7.6 | Third trimester ultrasound assessment of cardiac function in the detection and management of FGR

12:03 PO **TANJA GROTEN**
PO 26 | Cardiac dysfunction in fetal growth retardation measured by means of myocardial performance

12:06 D **PANEL**
Is there consensus on management, based on current evidence?

12:30 Lunch

13:20 SESSION 8: Prevention & Treatment

13:20 O **KASIA MAKSYM**
8.1 | Do we need treatment for severe early onset intrauterine growth restriction: Update on EVERREST Project

13:30 O **ANNA DAVID**
8.2 | Classifying adverse events in early onset FGR to develop a clinical trial dose-escalation plan

13:40 O **UWE SCHNEIDER**
8.3 | The relation between perinatal outcome and the diagnostic criteria of late fetal growth restriction

13:50 PO **TANJA GROTEN**
PO 27 | Pentaerithrityl tetranitrate (PETN) for secondary prevention of fetal growth restriction (PETN Trial)

13:53 O **MANOUK HENDRIX**
8.4 | Maternal vascular malformation in the placenta is an indicator for fetal growth restriction irrespective of neonatal birthweight

14:03 O **FRANCESCA PARISI**
8.5 | Impact of human embryonic morphological development on fetal growth parameters: the Rotterdam periconceptional cohort (PREDICT study)

FRIDAY 11th OCTOBER

Conference Day 2 (continued)

K Keynote 15+5 min | O Oral 7+3 min | PO Poster Oral 2+1 min | D Panel

14:13 O **JEZID MIRANDA**
8.6 | Identification of phenotypes of FGR using a network-based clustering approach

14:23 PO **POSTER ORALS 28 to 30**
Abstracts page 51

14:40 **SESSION 9: Management guidelines: putting evidence into practice**

14:40 K **LESLEY MCCOWAN**
9.1 | International review of growth guidelines

15:00 R **ROUNDTABLE:** National Guidelines for fetal growth surveillance and management
Dietmar Schlembach, Germany; Giuseppe Rizzo, Italy; Roger Newman USA; Jason Gardosi, UK

15:20 D **PANEL**
General discussion

15:40 Refreshment Break

16:00 **SESSION 10: Clinical case scenarios**

16:00 D **FACULTY**
Interactive presentations and discussion
Summary of take-home messages

17:15 **Best Abstracts: Prizes & Presentations**

17:30 Close

19:00 **Berlin Festival of Lights:** walk to Brandenburg Gate

E POSTERS WITH ORAL PRESENTATION

Selected for short-oral presentation and on display throughout the conference.
Abstracts within their respective sessions on pages 14-44, or as indicated below.

SESSION 1

PRADEEP ALUR
PO 1 | Sex differences in transition phase of nutrition in ELBW infants

EDURNE MAZARICO
PO 2 | Neonatal mortality and morbidity of extreme premature neonates with growth restriction

SESSION 2

HELEN BASTON
PO 3 | Engaging pregnant smokers with smoking cessation services: offering carbon monoxide self-monitoring

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OLIVER HUGH
PO 7 | Perinatal mortality and SGA rate according to Hadlock and customised fetal weight standards in a South Asian population

OLIVER HUGH
PO 8 | Customised vs population based fetal weight standards to define SGA at 22 weeks gestation

JUDIT MARTINEZ
PO 9 | Accuracy of Hadlock and INTERGROWTH formula for birthweight in pregnancies with suspected late IUGR

MARTA RIAL-CRESTELO
PO 24 | Prescriptive reference standards of third-trimester cerebroplacental ratio and its physiological determinants

SESSION 5 (Abstracts pp 45-50)

LUCY ARMATAGE
PO 10 | Impact of customised growth charts in a tertiary hospital – local data for shared decision making

ANAGHA CHIRDRAWAR
PO 11 | Audit of missed small for gestational age babies – does implementation of GAP training make a difference?

ANNA KAJDY
PO 12 | Fetal growth diagnosis and management among obstetric and neonatal medical professionals – preliminary results of a survey of practice

ANNIE BURRIN
PO 13 | Effect of implementation of GAP in Cardiff, Wales

BADENAN FATHULLA
PO 14 | Audit for detection of SGA babies at Royal Free Hospital using Growth Assessment Protocol

EZIAMAKA EZENKWELE
PO 15 | Obstetric risk factors for stillbirths in University of Nigeria Teaching Hospital (UNTH), Enugu

HEATHER WATSON
PO 16 | Treasure hunting – the midwife-led fetal growth assessment (MFGA) clinic to identify the high risk fetus in the low-risk pregnancy

KATARZYNA KOSIŃSKA-KACZYŃSKA
PO 17 | The knowledge and experiences of pregnant women regarding physical activity during pregnancy

JOTHILAKSHMI NALLATHAMBI
PO 18 | Detection of small for gestational age fetuses in a district general hospital

PRITI WUPPALAPATI
PO 19 | Antenatal corticosteroid administration prior to elective caesarean section in diabetic women between 37 to 38+6 weeks gestation – more harm than good?

SAUDABI VALAPPIL
PO 20 | Placenta clinic approach to screening for placental insufficiency

SIAN BULLOUGH
PO 21 | The intrapartum impact of failure to identify the SGA fetus prior to induction of labour

SESSION 6

MAGDALENA BEDNAREK-JĘDRZEJEK
PO 22 | Angiogenesis markers in ultrasound - confirmed late onset fetal growth restriction and their utility in determining the neonatal outcome

TANIA MENESES
PO 23 | sFlT1-PlGF ratio in early vs late FGR

SESSION 7

ANDREW SHARP
PO 25 | Pregnancy outcomes with raised umbilical artery doppler pulsatility index identified before 32 weeks gestation

TANJA GROTEN
PO 26 | Cardiac dysfunction in fetal growth retardation measured by means of myocardial performance index

SESSION 8 (Abstracts p 42 and p 51)

TANJA GROTEN
PO 27 | Pentaerithrityl tetranitrate (PETN) for secondary prevention of fetal growth restriction (PETN Trial)

GABRIELA LOSCALZO
PO 28 | MicroRNA-148B-3P and MicroRNA-25-3P are overexpressed in fetuses with late-onset fetal growth

KATARZYNA KOSINKA-KACZYNSKA
PO 29 | Low first trimester PAPP-A does not predict intrauterine growth restriction in twins

PAZ AHUMADA
PO 30 | Risk of C-section and neonatal intensive care unit admission in FGR clinical subtypes: IUGR type I and SGA fetuses

E POSTERS

On display throughout the conference. Abstracts on pages 52-56

ANDREJA TROJNER BREGAR
P1 | Have tall pregnant women heavy babies?

ANDREW SHARP
P2 | A rare case of extensive fetal intracranial haemorrhage in an early onset FGR infant

I.S. KOZLOVSKAIA
P4 | Causes of late miscarriages

I.S. KOZLOVSKAIA
P5 | Causes of late miscarriages in multiple pregnancies

IWONA SZYMUSIK
P6 | Neonatal outcomes of smaller twins in cases of birthweight discordance

JAN MODZELEWSKI
P7 | Comparison of detection rates using different growth charts

KATARZYNA KOSIŃSKA-KACZYŃSKA
P8 | Trends, attitude and knowledge about the methods of labour pain management among Polish women

SAUDABI VALAPPIL
P9 | Perinatal outcome in early onset fetal growth restriction – single centre experience

SHARON FAN
P10 | Preventing fetal growth restriction and other adverse outcomes in women with low PAPP-A: are we, in Hull, doing too much or not enough?

ABSTRACTS - ORAL PRESENTATIONS

SESSION 1: Intrauterine growth: outcomes for mother and infant

K

1.1 | Effect on pregnancy with growth disorders on long-term health of mothers & offspring

Birgit Arabin | Clara Angela Foundation Witten & Berlin | Dep. of Obstetrics Charite University Hospital Berlin, Germany

Physiologic adaptations during pregnancy unmask a woman's predisposition to diseases and can be predicted by first- to second trimester algorithms. They accelerate risks for chronic diseases in mothers and their offspring up to adulthood (Barker hypothesis). Vice versa, pregnancy diseases indicate maternal and grandparent's risks for chronic diseases (reverse Barker hypothesis). This is an appeal to prevent cardiovascular and metabolic diseases in mothers and their children as well as neurocognitive impairment in the offspring.

Women with a history of miscarriage, fetal growth restriction, pre-eclampsia, preterm delivery, obesity, minor and excessive gestational weight gain more frequently demonstrate with echocardiographic abnormalities, higher fasting insulin, lipids, and deviating clotting factors and show defective endothelial function. All abnormalities correlate with future maternal cardiovascular and metabolic complications and earlier mortality. Conversely, women with normal pregnancy outcome have lower rates of subsequent diseases than the general female population.

Although the placenta works as a gatekeeper, these pregnancy complications may also lead to sickness and earlier death in the offspring.

The prenatal period is also a crucial target for the primary prevention of neurodevelopmental and psychiatric disorders by reducing or preventing maternal stress associated with poor growth. Examples from animal studies encourage the application of so-called "environmental enrichment" as successful interventions to prevent behavioral, cognitive, emotional development, and susceptibility to neurodevelopmental and psychiatric disorders. We demonstrate impact of different stressors within two German health care systems on poor growth and report on our pilot studies of artistic interventions.

Maternal-fetal medicine specialists should have a key role in the prevention of non-communicable diseases by implementing a framework for patient consultation and interdisciplinary networks. Health care providers and policy makers should increasingly invest in health literacy , awareness and prevention of unnecessary gaps between pregnancy and long-term cardiovascular, metabolic and psychological diseases.

O

1.2 | Maternal stress, anxiety and depression in severe fetal growth restriction

Kasia Maksym | **Anna David** | University College London, London, UK

Objective: Anxiety, depression, and post-traumatic stress disorder (PTSD) are common after preterm birth, stillbirth and in women with pre-existing mental health disorders. Severe fetal growth restriction (FGR) is a stressful pregnancy complication but little is known about its effects on maternal mental health. We evaluated the prevalence of antenatal and postnatal anxiety, postnatal depression (PND), and postnatal post-traumatic stress disorder (PTSD) in women with severe early-onset FGR.

Methods: Singleton pregnant women (March 2013-July 2019, estimated fetal weight <3rd percentile, <600g, gestational age 20+0-26+6 weeks) were recruited from one of the European maternal-fetal centers within the EVERREST prospective observational study (UCLH London UK). After giving informed written consent, we assessed mental health symptoms using self-reported questionnaires twice (State-Trait Anxiety Inventory, STAI) once at enrolment (STAI_ENR) and again 6-12 weeks after birth (STAI_PP); the Edinburgh Postnatal Depression Scale (EPDS) and the perinatal PTSD Questionnaire (PPQ) were also evaluated 6 -12 weeks after birth.

Result: Of 66 participants, 42 responded to STAI_ENR, 24 to STAI_PP, 28 to EPDS and PPQ. Women had a high prevalence of anxiety antenatally (31/42, 73.8%) and postpartum (14/24, 58.3%), and a high rate of postnatal depression (10/28, 35.7%) and postnatal PTSD (9/28, 32.1%). The mean EPDS score was lower in women with a medical history (5.80, n=10) compared to those with no medical history (11.00, n=17, p=0.035). Pregnancy loss and delivery at a lower gestational age were both risk factors for postnatal PTSD. Anxiety level generally decreased after childbirth but antenatal anxiety level strongly predicted postnatal anxiety and PND.

Conclusion: A high prevalence of antenatal and postnatal maternal mental health disorders were demonstrated in this observational study of severe early onset FGR. Further studies investigating treatment and preventative strategies are warranted.

O

1.3 | Transition to neonatal life in the growth restricted fetus – what do we need to tell our neonatology colleagues?

Ahmet Baschat | John Hopkins University, Baltimore, USA

Placental insufficiency leading to growth restriction poses several challenges to the developing fetus. The principal challenge is that in a setting where the placental nutrient, gas and fluid transfer is limited the fetus has to develop adaptive responses. Since fetal nutrient allocation to various organs is primarily achieved through the circulation such adaptive responses include brain sparing, adrenal sparing, liver sparing and heart sparing effects. Prolonged persistence of these adaptive states leads to intermediate or long-term modifications in organ function. Particularly in the preterm growth restricted fetuses some of these responses pose unique challenges immediate following delivery that require special consideration.

The neonatal effects of placental disease include hematologic abnormalities that are associated with sustained bleeding risks. A reprogramming of the pulmonary vascular bed predisposes the neonate to persistence of the fetal circulation. Advanced venous Doppler abnormalities predispose the neonate to persistent cardiovascular instability with challenging blood pressure management. Liver sparing predisposes to sustained liver dysfunction with additional impact on blood clotting. The persistence of high resistance aortic flow patterns is associated with sustained bowel hypoperfusion after birth. A detailed overview over the fetal challenges and their potential significance in neonatal life can be beneficial for the neonatologist caregivers following delivery.

O

1.4 | A reduction in sedentary behaviour in obese women reduces neonatal adiposity: the Dali randomized trial

Gernot Desoye[2] | Mireille NM van Poppel [1,2] | David Simmons[3,4] | Roland Devlieger[5] | F. Andre van Assche[5†] | Goele Jans[5] | Sander Galjaard[5,6] | Rosa Corcoy[7] | Juan M Adelantado[7] | Fidelma Dunne[8] | Jürgen Harreiter[9] | Alexandra Kautzky-Willer[9] | Peter Damm[10] | Elisabeth R Mathiesen[10] | Dorte M Jensen[11] | Lise-Lotte Andersen[11] | Mette Tanvig[11] | Annunziata Lapolla[12] | Maria Grazia Dalfra[12] | Alessandra Bertolotto[13] | Ewa Wender-Ozegowska[14] | Agnieszka Zawiejska[14] | David Hill[15] | Frank J Snoek[1] | Judith GM Jelsma[1]

[1]Amsterdam UMC, The Netherlands | [2]University of Graz, Austria | [3]Western Sydney University, Australia | [4]Addenbrooke's Hospital, England | [5]University Hospitals Leuven, Belgium | [6]Rotterdam UMC, The Netherlands | [7]Institut de Recerca de l´Hospital de la Santa Creu i Sant Pau, Spain | Instituto de Salud Carlos III, Zaragoza, Spain | [8]National University of Ireland, Ireland | [9]Medical University of Vienna, Austria | [10]University of Copenhagen, Denmark | [11]Odense University Hospital, Denmark | [12]Universita Degli Studi di Padova, Italy | [13]Azienda Ospedaliero Universitaria – Pisa, Italy | [14]Poznan University of Medical Sciences, Poland | [15]Recherche en Santé Lawson SA, Switzerland

Objective: Offspring of obese women are at increased risk of features of the metabolic syndrome, including obesity and diabetes. Lifestyle intervention in pregnancy might reduce adverse effects of maternal obesity on neonatal adiposity.

Method: In the Vitamin D And Lifestyle Intervention for Gestational Diabetes Mellitus (GDM) Prevention (DALI) lifestyle trial, 436 women with a BMI ≥29 kg/m2 were randomly assigned to counselling on healthy eating (HE), physical activity (PA) or HE&PA, or to usual care (UC). In secondary analyses of the lifestyle trial, intervention effects on neonatal outcomes (head, abdominal, arm and leg circumferences and skinfold thicknesses, estimated fat mass, fat percentage, fat-free mass and cord blood leptin) were assessed using multilevel regression analyses. Mediation of intervention effects by lifestyle and gestational weight gain was assessed.

Results: Outcomes were available from 334 neonates. A reduction in sum of skinfolds (−1.8 mm; 95% CI −3.5, −0.2; p = 0.03), fat mass (−63 g; 95% CI −124, −2; p = 0.04), fat percentage (−1.2%; 95% CI −2.4%, −0.04%; p = 0.04) and leptin (−3.80 µg/l; 95% CI −7.15, −0.45; p = 0.03) was found in the HE&PA group, and reduced leptin in female neonates in the PA group (−5.79 µg/l; 95% CI −11.43, −0.14; p = 0.05) compared with UC. Reduced sedentary time, but not gestational weight gain, mediated intervention effects on leptin in both the HE&PA and PA groups.

Conclusion: The HE&PA intervention resulted in reduced adiposity in neonates. Reduced sedentary time seemed to drive the intervention effect on cord blood leptin. Implications for future adiposity and diabetes risk of the offspring need to be elucidated.

Trial registration ISRCTN70595832.

O

1.5 | SGA and LGA newborns have increased mortality risk during the first year of life: a cohort analysis of 10 years of live births in the USA

Jezid Miranda | Angel Paternina-Caicedo | Natalia Maestre | José Rojas-Suarez | Jorge E. Tolosa | Universidad de Cartagena, Colombia | Oregon Health & Science University, USA | ESE Clinica Maternidad Rafael Calvo, Colombia

Objective: To estimate the survival probability during the first year of life in all live-births in the USA (US), according to their birthweight (BW) centile.

Method: The US linked birth and infant death datasets were collected from public repositories, for all singleton live-births in the US between 2004-2013. Livebirths were classified according to their BW centile according to the WHO Fetal Growth Charts, by gestational age and sex. Causes of deaths were stratified according to the coding of the 10 version of the International Classification of Diseases of the Global Burden of Disease study. Kaplan-Meier analyses were used to estimate survival of all-cause deaths and competing-risk curves for survival of cause-specific death.

Results: A total of 39.7 million live-births occurred between 2004-2013 in the US. Of these, BW and gestational age was documented in 38.0 million live births. Newborns with the greatest survival at one-year of life were those with a BW between the 50-75th centile [99,633/100k; 95% CI, 99,629-99,637] The frequency of small-for-gestational age, defined as a BW centile <10th centile was 12.7%, while the frequency of large-for-gestational age (>95th centile, LGA) was 7.1%. The lowest survival probability at one-year of life was found in newborns with a BW centile <5th (97,837/100k; 95% CI, 97,818-97,855), followed by those with a BW >95th centile (99,142/100k; 95% CI, 99,132-99,153). When stratified according to causes of death, newborns with a BW <5th centile had the lowest survival probability in all causes of death including cardiovascular diseases (Figure 1B); except for malignant neoplasms, where newborns with a BW centile >95th had the greatest mortality (Figure 1C).

Conclusions: Livebirths with a BW <5th centile and LGA newborns have the largest risk of dying during infancy in the US. LGA newborns have the lowest probability of survival from malignant neoplasms.

PO

PO 1 | Sex differences in transition phase of nutrition in ELBW infants

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Sex specific differences in growth of preterm infants are well known. However, published evidence on sex specific nutrition requirements is lacking in ≤1kg birth weight infants (ELBW).

Objective: We evaluated if there are any sex differences in the effect of calories and protein on weight gain during the transition phase (TP) of nutrition in ELBW infants.

Methods: A retrospective review of ELBW infants born from 2014-16 was performed. All infants were included except those with NEC, short bowel, or chromosomal anomalies. TP was defined as the period when the infant's enteral feeds were increased from 30-120 ml/kg/day as parenteral nutrition (PN) was weaned. Infant demographics, nutritional data and growth parameters during TP were analyzed. All ELBW infants were started on 100 ml/kg/d and a goal of 4 g/kg/d of protein in PN after birth. Dextrose and lipids in PN were advanced based on the tolerance. Enteral nutrition was started with breast milk and advanced by 10-20ml/kg/d as tolerated.

Results: We analyzed 95 ELBW infants. The demographics, Calorie & Protein intake were similar in both sexes. There was a significant (r=0.22, p = 0.026) correlation of total C intake with a change in wt.pc for the whole group. On sex-specific analysis, total C intake significantly correlated with a change in wt.pc only in girls (r=0.28, p = 0.015) Protein intake did not correlate with weight percentile or sex. Girls lost 8.7% of their weight percentiles, whereas boys gained 4.24% of weight percentiles during transition phase (p =0.14). Girls lost 15.45% and boys maintained head circumference percentiles during TP (p =0.29).

Conclusions: Despite similar intake of calories and protein during TP, there was a significant decrease in weight percentiles only in girls. Large prospective studies may help us understand if ELBW girls need higher calories or have a higher metabolic rate.

PO

PO 2 | Neonatal mortality and morbidity of extreme premature neonates with growth restriction

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Objective: To determine the neonatal mortality rate and neonatal outcomes of extreme pretem babies with growth restriction.

Methods: A retrospective cohort was created of 47 consecutive, prenatally diagnosed, intrauterine growth restricted babies born <28.0 weeks between 2008-2018. Fetal growth restriction was defined as a birth weight centile <10th (Intergrowth-21st charts). Neonatal mortality was that occurring before 28 days of life. Neonatal complications included: acidosis, intraventricular hemorrhage (IVH) grade III or IV, periventricular leukomalacia (PVL), necrotizing enterocolitis (NEC), sepsis, bronchopulmonary dysplasia (BPD) or retinopathy.

Results: The overall neonatal mortality rate was 40.4% (19/47). According to the gestational age at delivery (truncated weeks) the mortality rates were: 100% at 24 weeks, 60% at 25 weeks, 47.1% at 26 weeks and 22.7% at 27 weeks. Table 1 shows the neonatal mortality rates according to sex, weeks of gestation and Doppler abnormalities. Table 2 shows the perinatal characteristics of the cohort and the rates of neonatal complications.

Conclusion: Neonatal mortality and morbidity are high in fetal growth restricted babies born before 28 weeks. This should be considered in the counseling of these patients.

Session 2: Associations and risk factors

O

2.1 | Folic acid supplementation is associated with size at birth in the screening for pregnancy endpoints study

Lesley McCowan[1] | RE Bulloch[1] | CR Wall[1] | JMD Thompson[1] | RS Taylor[1] | L Poston[2] | CT Roberts[3] | GA Dekker[3] | LC Kenny[4] | NAB Simpson[5] | J Myers[6] | University of Auckland, New Zealand[1] | King's College London, UK[2] | University of Adelaide, Australia[3] | University of Liverpool, UK[4] | University of Leeds, UK[5] | University of Manchester, UK[6]

Objective: To investigate the relationship between maternal folic acid supplement (FAS) use pre-conception through to the second trimester and small-for-gestational age (SGA) and birth size.

Methods: 5606 nulliparous women with singleton pregnancies in the Screening for Pregnancy Endpoints (SCOPE) study were recruited from New Zealand, Australia, UK and Ireland. Information on FAS use pre-conception, during the first trimester and at 15±1 weeks' gestation was collected. Pregnancy outcome data and birth size measurements were collected within 72 hours of birth. Multivariable regression analysis investigated relationships between FAS and outcomes adjusting for maternal socio-demographic and lifestyle factors. The primary outcome was SGA (<10th customised birthweight centile).

Results: SGA prevalence was 11.3%. Fifty-eight percent (n=3268) took FAS pre-conception, 97% (n=5380) in the first trimester and 70% (n=3907) at 15±1 weeks' gestation. Pre-conception FAS was associated with reduced SGA: aOR 0.82 (95% CI: 0.67-1.00; p=0.047). FAS use at 15±1 weeks' gestation was associated with a significant increase in customised centile: (β 2.56 (95% CI: 0.87-4.26) and a non-significant reduction in SGA: aOR 0.85 (95% CI: 0.71-1.02).

Conclusions: FAS use prior to pregnancy and at 15±1 weeks of gestation was significantly associated with birth size parameters. FAS continued beyond the first trimester may be beneficial for fetal growth. Further studies should investigate the independent association between FAS in the second and third trimester and birth size outcomes.

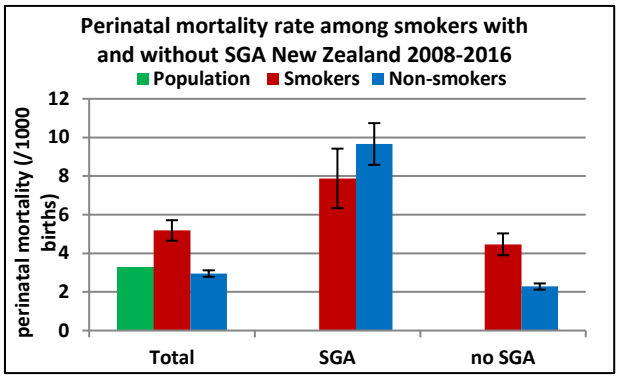
O

2.2 | How might smoking help us to understand the causes of fetal growth restriction?

Lynn Sadler | S Crengle | N Anderson | Lesley McCowan | University of Auckland, New Zealand

Objective: To determine whether smoking has the same associations with perinatal mortality among SGA as among non-SGA babies.

Method: Analysis of perinatal mortality rates in a retrospective national cohort of singleton non-anomalous >26 week births and perinatal deaths in New Zealand (NZ) from 2008-2016; with SGA categorised using the NZ customised birthweight centile calculator. Perinatal mortality defined as stillbirth from 26 weeks and neonatal deaths up to the 27th day.



Results: 468,394 births were analysed, 44,709 of whom were SGA. Perinatal mortality in the total population was 1,539/468,394 (3.29/1000 births) and in the SGA population 409/44,709 (9.1/1000). The perinatal mortality rate was higher among SGA babies of non-smokers (9.7/1000; 95%CI 8.6-10.7)) than among SGA babies of smokers (7.9/1000 (95%CI 6.3-9.4)). Among non-SGA babies, the risk of perinatal mortality was significantly higher among smokers (4.5/1000 (95%CI 3.9-5.0)) than among non-smokers (2.3/1000 (95%CI 2.1-2.4))(fig). In this national cohort, among SGA babies born at term (>37 weeks), more babies of smokers (55.8%) were born before 40 weeks' than babies of non-smokers (53.5%).

Conclusion: Smoking has a paradoxical effect on perinatal mortality among SGA babies, consistent with a previous report. The similar gestation at birth in SGA subgroups does not support the suggestion by Gardosi (2013) that the lower perinatal mortality risk among SGA babies of smokers is explained by antenatal detection. Instead, we hypothesise it might be explained by differences in placental pathology in SGA placentae of smokers versus non-smokers and s-Flt1 is a potential mediator.

PO

PO 3 | Engaging pregnant smokers with smoking cessation services: offering carbon monoxide self-monitoring

Helen Baston | Nicola Pearson | Tom Almond | Sheffield Teaching Hospitals NHS Foundation Trust, England, UK

Background: Smoking in pregnancy is one of the key contributors to poor clinical outcomes, and the developing baby is at increased risk of being small for gestational age (Royal College of Physicians 2018). Pregnant smokers who live with other smokers are six times more likely to smoke or relapse if they quit (Smoking in Pregnancy Challenge Group 2018), hence interventions that engage wider family members, have the potential to enhance their impact.

Objective: This paper describes a service evaluation to explore the feasibility of using carbon monoxide (CO) self-monitoring amongst a cohort of pregnant smokers in the North of England. CO monitoring throughout pregnancy by health professionals is a valuable tool to help prompt a quit attempt and a pilot study of the general (non-pregnant) smoking population (Beard & West 2012) showed that personal CO monitoring increased smokers motivation to quit.

Methods: The project has three phases; 1) interviews with pregnant smokers to explore their understanding and experience of CO monitoring and gauge interest in self-monitoring of their CO levels at home; 2) monitoring personal CO levels (and family if they wish) and recording on a visual chart; 3) interviews with women who engaged with self-monitoring to elucidate their experiences and suggestions for further development.

Results: Data will be presented related to the feasibility, acceptability and transferability of the initiative for both women and the midwives involved. Evaluation of the use of the bespoke visual tool will be shared and along with lessons learned.

2.3 | Heavy metal levels in placenta in fetuses with FGR and AGA

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Objective: To evaluate maternal and fetal exposure to Arsenic, Cadmium, Mercury, Lead, Selenium and Zinc assessed by the levels of these heavy metals in the placenta and their relationship with fetal growth, placental function and perinatal outcomes.

Methods: Concentrations of Arsenic, Cadmium, Mercury, Lead, Selenium and Zinc were analyzed in a total of 187 placentas by High Resolution ICP-MS, inductively coupled plasma sector field mass spectrometer (ICP-SFMS). The following data was evaluated: maternal characteristics (race, education, tobacco, alcohol intake, drug intake, nulliparity and in vitro fertilization techniques), fetal growth (diagnosis of AGA vs FGR: small for gestational age (SGA) or intrauterine growth restriction (IUGR)), Doppler measurements (umbilical artery Pulsatility Index, middle cerebral artery Pulsatility Index, cerebro-placental ratio and uterine arteries Pulsatility Index), other gestational complications (gestational diabetes, hypertensive disorders and preeclampsia), and perinatal outcomes (Apgar score <7 at 5 minutes, umbilical cord pH<7.10 and emergent cesarean section).

Results: Higher concentration of Cadmium is associated with abnormal cerebroplacental ratio and IUGR ($p<0,05$) and higher concentration of Selenium, with normal umbilical and middle cerebral artery and AGA ($p<0.05$). Regarding maternal characteristics or gestational complications, no association was found with any of the heavy metals' concentrations. Arsenic has been detected in 1 out of the 187 patients. The Mercury is in the process of analysis and we are awaiting the final results.

Conclusion: The environment, such as quemicals, determines health already in early stages of life. The fetus is not exempt from its influence. Cadmium negatively influences the functioning of the placenta and fetal growth, while Selenium acts as a protector. Knowing the influence of exposure to heavy metals can help to understand better physiopathological mechanisms, as well as make public health recommendations.

2.4 | Human fetal growth restriction is influenced mainly by maternal socioeconomic status: an ecological study within a city from a developing country

Jezid Miranda | Natalia Maestre | Angel Paternina | Oscar La Valle | José A. Rojas | Francesc Figueras
BCNatal, Hospital Clínic and Hospital Sant Joan de Deu, Centre for Biomedical Research on Rare Diseases, Barcelona, Spain |Universidad de Cartagena, Colombia | GRICIO, University of Cartagena, Colombia | ESE Clinica Maternidad Rafael Calvo, Colombia | ESE Local Hospital Cartagena de Indias, Colombia | Clinica Santa Cruz de Bocagrande, Colombia.

Objective: The current main hypothesis to explain the majority of cases of fetal growth restriction (FGR) is placental insufficiency. However, compared to developed countries, the rate of FGR is higher in developing countries which has been attributed to infectious diseases or ethnic differences. Yet, whether maternal socioeconomic status has an influence in fetal growth has not been fully elucidated. The objective of this study was to assess ecogeographic differences in the distribution of FGR in a city and to assess whether the pattern is influenced by maternal socioeconomic status.

Methods: This population-based, ecological study involved data from a local database comprising 8675 deliveries between 24 and 42 weeks in three obstetric centers from Cartagena in northern Colombia during the period 2017-2018. Infants were classified as SGA (birthweight <10th centile) according to INTERGROWTH-21st standards. Maternal socioeconomic status was assigned according to maternal affiliation to the health care system and the design code of the geographical area of the city. Frequency variability of SGA neonates among city geographic areas and the influence of maternal socioeconomic status were calculated.

Results: The frequency of SGA newborns according to the INTERGROWTH-21st standard was 8.1%. The rate of SGA neonates per neighborhood was significantly higher in the lower income socioeconomic area than in the higher income socioeconomic areas [5-11% (810/7369) vs 1-5% (65/1306); $p <0.05$]. In addition, the median birthweight centile was significantly lower in low-income neighborhoods compared to higher-income neighborhoods on the city map.

Conclusions: Maternal socioeconomic status have a large influence in human fetal growth, since the highest percentage of SGA neonates were identified in deprived socioeconomic areas within the city. Future studies are required to explore the complex interrelation between biological, socio-economic and environmental factors that affect maternal-fetal health.

PO

PO 4 | Outcomes of fetal growth restriction: does maternal age matter?

Catarina Palma dos Reis | Tânia Meneses | Bruno Carrilho | Natacha Oliveira | Ana Campos | Ana Teresa Martins |
Maternidade Dr. Alfredo da Costa, Centro Hospitalar Universitário Lisboa Central, Portugal

Objective: This study was aimed at addressing the gap in knowledge regarding the impact of maternal age on the outcomes of FGR.

Methods: We conducted a three-year prospective observational study, including singleton gestations diagnosed with FGR (defined as an EFW and/or AC < 10th centile) and delivered in our center, following our standing protocol (1). We excluded fetal or chromosomal abnormalities. Diagnosis before 32 weeks were considered early-onset FGR. Data was obtained from Astraia® and clinical files.

Results: We analysed 282 gestations with FGR. 150 cases (53%) were early-FGR, and the remaining 132 (47%) were late-FGR. Mean maternal age was 31.6 years, and 95 women (33%) were >= 35 years old. 12 women (6%) had chronic hypertension and 41 (22%) were smokers. Mean gestational age (GA) at diagnosis of FGR was 30.3 weeks (27 weeks for early-FGR and 34 weeks for late-FGR). Mean GA at delivery was 36 weeks (34.7 weeks for early-FGR and 37.4 weeks for late-FGR). Maternal and pregnancy characteristics according to age are described on table 1.

A multiple linear regression model testing the influence of maternal age on GA at delivery, controlling for chronic hypertension, smoking status and GA at diagnosis of FGR, revealed that a 5-year increase on maternal age significantly decreases GA at delivery in 3.5 days (p=0.02).

Conclusions: GA at diagnosis of FGR was not affected by maternal age. However, older mothers deliver at consistently lower GA, even after controlling for confounders. These findings suggest that older women might have a decreased placental perfusion reserve, leading to hastened clinical decline. This may help tailor obstetric surveillance in this population.

Table 1. Maternal and pregnancy characteristics according to maternal age

	Maternal age > = 35 years old		
	No (n=194)	Yes (n=95)	p
Maternal characteristics			
Mean age, mean (SD)	29 (4.7)	38 (2.6)	<0.01*
Chronic hypertension, n (%)	7 (5.4)	5 (8.5)	0.422
Tobacco use	32 (25.4%)	9 (16.4%)	0.175
Pregnancy characteristics			
Gestational age at diagnosis of FGR, mean (SD)	30.3 (0.32)	30.1 (0.52)	0.750
Preeclampsia, n (%)	8 (4.1%)	5 (5.3%)	0.662
Motive for delivery			
Maternal, n (%)	8 (6.2%)	9 (15.8%)	<0.01*
Fetal, n (%)	122 (93.9%)	48 (84.2%)	<0.01*
Fetal outcomes			
Fetal demise, n (%)	4 (2.4%)	1 (1.4%)	<0.01*
Gestational age at delivery, mean (SD)	36.3 (0.23)	35.2 (0.44)	0.022*
Mean neonatal birth weight in grams, mean (SD)	2214 (49.9)	2003 (73)	0.018*

Session 3: Diabetes in pregnancy

K

3.1 | Diabetes and fetal growth: pre-gestational and GDM; role of diabetic control; roles and limitations of Doppler

Suresh Seshadri | Uma Ram | Suresh Sudarshan | Mediscan Systems & Seethapathy Clinic and Hospital

Fetal growth is a dynamic process and is regulated by maternal, fetal , placental and environmental factors. Diabetes in pregnancy impacts fetal growth in all trimesters of pregnancy. In the first trimester, a shorter CRL for GA may be pointer for severe anomalies. Environmental factors have an effect on fetal “fat” mass while genetic influences are more seen in fetal fat free mass. Serial ultrasound assessments with abdominal circumference and estimated fetal weight will help identify “trends” in fetal growth especially those fetuses which cross centiles without actually crossing the 95th centile. Macrosomia is one of the common adverse outcomes associated with diabetic pregnancy with poor glycemic control. The abdominal circumferences of LGA babies have been found to be larger at 18 weeks suggesting that fetal growth is determined early.

While the association of fetal growth and macrosomia is established, the STORK study has shown ethnic variations in fetal growth in GDM. European fetuses exposed to GDM also tended to be smaller in week 24 and show faster growth than their non-GDM counterparts whereas South Asian fetuses exposed to mild GDM had a similar size and growth rate during the second half of pregnancy as South Asian non-GDM fetuses. This further reiterates the “thin fat Indian phenotype” in Diabetes as described in the Pune maternal nutrition study. Fetal abdominal fat increase precedes the onset of GDM and may provide an opportunity to identify at risk fetuses early. Strict glycemic control can result in SGA babies which is of equal concern. Higher risk of FGR is seen in women with vasculopathy. Doppler studies are limited to those women who have vasculopathy.

O

3.2 | Diabetes mellitus: pathophysiological background for increased risk of fetal demise in late pregnancy

Torvid Kiserud | Agnethe Lund | C Ebbing | S Rasmussen | J Kessler |
University of Bergen | Haukeland University, Bergen, Norway

Objective: Umbilical venous return is distributed either to the fetal liver (80%) or to the ductus venosus (20%). Umbilical flow to the fetal liver is essential for fetal growth. On the other hand, ductus venosus shunting is critical to survive hypoxic challenges. We studied this section of fetal circulation in pregnancies with diabetes mellitus compared with that of a low-risk reference population and with those with fetal macrosomic growth without diabetes.

Methods: Women with pre-gestational diabetes mellitus (N=49), low-risk women (N=160), and macrosomic fetal growth but no diabetes (N=25) were studied longitudinally during the second half of pregnancy. Blood flow was determined in the umbilical vein, ductus venosus, left portal branch and main portal vein and related to fetal weight.

Results: During the 3rd trimester, fetuses of diabetic mothers had wider ductus venosus, but with lower blood velocity and flow compared with the reference populations. Second, umbilical flow to the fetal liver was higher in diabetic pregnancies in the 2nd trimester, but in the 3rd trimester, flow did not match fetal growth in the same way as the low-risk group or non-diabetic macrosomic did. Third, degree of circulatory distortion was related to degree of glycemic control (HbA1C) and cord lactate at birth.

Conclusion: At mid-gestation, maternal diabetes mellitus has distorted the umbilical flow distribution in the fetus causing an upregulated liver perfusion. During the 3rd trimester, however, umbilical flow does not increase correspondingly to match fetal growth, but the priority distribution to the liver is maintained on the expense of ductus venosus shunting. The result is a reduced capacity to meet hypoxic challenge with an increased ductus venosus flow that would have spared the heart and brain. This corroborates the fact that lactate concentration is increased in cord blood in those with a low ductus venosus flow.

PO

PO 5 | Outcome of large for gestational age fetuses in non-diabetic mothers

Tamal Datta | E Ibrahim | R Viswanatha | R Ganapathy | Epsom & St Helier University Hospital, London, UK

Objective: Assess birth outcomes of babies identified as LGA on GAP chart in the absence of gestational diabetes.

Method: Cohort of 5,668 live births over one year (June 2016 and July 2017) identified 628 live births at term (>37weeks) as LGA on the customised bulk centile calculator. 90 of these were excluded due to maternal diabetes. Intrapartum and neonatal outcomes for the 528 cases were extracted from the Electronic maternity database/records.

Results: The cases included 240 primigravidas and 298 multigravid pregnancies. In these 82.3% had a BMI <30. Antenatal suspicion led to a growth scan in 58% after 35 weeks' gestation. Scans predicted 33% as LGA>90th centile. Vast majority delivered at 37-40wks (64%); 40+1 to 41 weeks (22%); and 14% at > 41 weeks of gestation. Rates of induction of labour, spontaneous vaginal birth, instrumental birth and caesarean were 26%, 45%, 15.4% and 40% respectively. Obstetric complications of major haemorrhage, third degree tear and sepsis were seen in 5.5%, 5.9% and 1.3%. Neonatal complications studied admission to NNU (2%), cord pH <7.1 (4.2%) and shoulder dystocia (2.7%) There was 1 case of an early neonatal death associated with vasa praevia. Composite neonatal complication rate for LGA babies <4.0kg and >4.0kg was 8.2% and 10% respectively.
Composite obstetric complication rate for LGA babies <4.0kg and >4.0kg was 14.6% and 11.6% respectively.

Conclusion: Given the findings of this study there appears to be a trend towards obstetric and neonatal complications in LGA fetuses <4.0kg and >4.0kg. This needs to be incorporated into the information given to mothers and planning mode and timing of birth at term and not >40 weeks of gestation.

P O

PO 6 | Beyond carbohydrates: the association between fat consumption and fetal overgrowth with type 1 diabetes

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Objective: To examine the relationship between fetal overgrowth and carbohydrate and fat consumption, frequency of meals and snacks, and weight gain in pregnancies complicated by type 1 diabetes.

Methods: Retrospective analysis of dietary and glucose records at 29-32 weeks gestation from 50 pregnancies. Glycemic measures and carbohydrate and fat consumption were compared on the basis of fetal overgrowth, defined as birthweight ≥ 90th customized centile. Meals and snacks with > 30 g of fat were considered high-fat. Regression analysis incorporated factors associated with overgrowth. Before entry, continuous variables were dichotomized based on the most discriminative value on their receiver operating characteristic curves. Bootstrapping was used for internal validation of the model.

Results: Fetal overgrowth complicated 33 (66%) pregnancies analysed. Women with fetal overgrowth were older (30.8 ± 5.4 vs. 27.5 ± 5.0, P 0.04) and their rate of weight gain was higher (0.48 ± 0.17 vs. 0.35 ± 0.14 kg/week, P 0.02) than those who had a birthweight < 90th centile. No significant difference in carbohydrate consumption or the total number of high-fat meals and snacks consumed was found. However, in addition to rate of gestational weight gain ≥ 0.5 kg/week (aOR 13.40, 95% CI 2.14-83.80), the only independent predictors of fetal overgrowth were glucose values following high-fat meals: ≥ 80% of fasting values > 90 mg/dL (aOR 7.54, 95% CI 1.36-41.77) and preprandial lunch and dinner values ≥ 145 mg/dL (aOR 10.47, 95% CI 1.76-62.23). The bootstrapped area under the receiver operator characteristic curve for the multivariable model predicting fetal overgrowth was 0.86 (95% CI 0.64-0.91).

Conclusion: While carbohydrate intake has long been the focus of dietary management, glycemic response to consumption of a high-fat diet and weight gain in pregnancies complicated by type 1 diabetes warrant close monitoring to reduce the risk of fetal overgrowth.

Session 4: Fetal growth, size and standards for measurement

O

4.1 | Fetal size vs growth in predicting outcome

Francesc Figueras | University of Barcelona, Spain

Fetal growth is a complex and dynamic process. Therefore, longitudinal evaluation of fetal growth has been proposed to be more appropriate to capture this dynamic nature than single time-point measurements. Some studies have evaluated whether longitudinal assessment improves identification of fetuses at risk of growth abnormalities and their related morbidity, reporting conflicting results. This may be due to methodological differences in the longitudinal assessment (from straightforward z-velocities to more sophisticated conditional centiles or individualized growth trajectories), in the time interval between examinations or the baseline time point of evaluation, in the targeted population (low-risk vs. high-risk) and in the aimed outcome to be predictive (SGA, adverse outcome or long-term consequences). In addition, it is not clear whether longitudinal assessment adds to Doppler evaluation in identifying high-risk SGA fetuses. While it is conceptually sound that longitudinal growth assessment has the potential to capture better the dynamics of fetal growth than cross-sectional evaluation, there are many unknown aspects on its applicability that limit its clinical use.

4.2 | Physiological fetal growth retardation; the WHO fetal growth study

Torvid Kiserud | J Carvalho | G Piaggio | R Gonzalez | A Benachi | A Tabor | K Hecher | A Diemert | H Abdel-Aleem| AT Kitoto | V Lokomba | G Carroli | AM Gülmezoglu | LD Platt
Haukeland University Hospital, Norway | University of Bergen, Norway | World Health Organization, Switzerland

Objective: Fetal growth retardation (restriction) is associated with increased perinatal risks. Both early onset and late onset growth retardation are prominent clinical concepts, but do we know the natural development of growth velocity in late pregnancy? We studied the fetal growth velocity during 2nd and 3rd trimester.

Methods: We used data from the WHO fetal growth study that included prescriptively healthy pregnant women from 10 countries. We used pairs of estimated fetal weight determined by repeated ultrasound measurements and calculated growth velocity in g/week. Breaking point for the growth velocity was defined as the time when the derivative of velocity was zero.

Results: Of the 1,439 women enrolled, 1,298 had serial measurements that could be analyzed. There was a considerable variation of growth velocity. E.g. at 33 weeks of gestation, the velocity variation was 113–260 g/week (2.5–97.5 percentile), and correspondingly at 40 weeks 47–394 g/week. All fetuses entered the second half of pregnancy with an accelerative growth pattern that stagnated in the 3rd trimester, but this growth retardation started at different stages of gestation:

Growth velocity percentile 2.5 at gestational week	29^{5d}
Growth velocity percentile 5	31^{1d}
Growth velocity percentile 10	32^{3d}
Growth velocity percentile 25	35^{4d}
Growth velocity percentile 50	38^{5d}
Growth velocity percentile 75-97.5	≥40

Conclusion: Growth retardation is a normal part of fetal growth during the 3rd trimester, following a long period of accelerative growth. It starts graded according to growth velocity, the smallest fetuses the earliest. It may be perceived as normal fetal adaptation to available resources and maternal constraints and should be taken into account when defining and using diagnostic criteria for so called late onset growth retardation.

4.3 | Slow growth defined by customised growth trajectory and adverse perinatal outcome

Andre Francis | Oliver Hugh | Jason Gardosi | Perinatal Institute, Birmingham, UK

Objective: Slow growth is associated with adverse perinatal outcome. We wanted to assess the predictive value of fetal growth trajectories when measured against optimal growth as defined by customised charts.

Method: Retrospective cohort study of 161,936 pregnancies with routinely collected data, including 23,417 with at least 2 third trimester scan-estimated fetal weights (EFW), delivered at or after 36 weeks gestation. For each pregnancy, the scan closest to 28 weeks (median 199 days) was paired with the last scan before birth (median 256 days) to define its own growth trajectory or slope of growth. Each pregnancy's growth curve and weights at scan and at birth were compared with the predicted EFWs, birthweights and growth curves based on its own customised GROW standard (Gestation Related Optimal Weight, www.gestation.net). Adverse outcomes included SGA at birth (n=2,227), Apgar score <7 at 5 minutes (n=231), admission to neonatal unit (NICU, n=650) and perinatal death (n=57). Associations were expressed relative risk (RR), 95% confidence interval (95% CI) and population attributable risk (PAR).

Results: The Table compares 1. normal growth, defined as trajectories within the interquartile range (25th–75th) on the customised GROW chart and 2. slow growth (FGR), defined by a trajectory slower than the 3rd customised centile. Slow growth was a strong predictor of SGA birthweight, although in 34.6% of pregnancies with slow growth, the weight at birth was not SGA. Normal growth was protective of adverse outcome, while slow growth was strongly associated with adverse outcome, including RR of 4.3 (1.9-9.9) for perinatal mortality.

Table 1. Pregnancies with normal (p25-75) and slow growth (p<3) and perinatal outcome

	Normal Growth (n=7,614)			Slow Growth (n=2,935)		
	RR	95% CI	PAR	RR	95% CI	PAR
SGA at birth	0.5	0.4 - 0.5	-16.9	10.3	9.4-11.4	47.3
Apgar <7 at 5	0.8	0.6 - 1.1	-6.5	1.7	1.2 - 2.5	16.6
NICU admission	0.4	0.3 - 0.5	-23.7	2.5	1.9 - 3.3	27.2
Perinatal death	0.4	0.2 - 0.8	-24.8	4.3	1.9 - 9.9	48.0

Conclusion: Normal fetal growth as defined by customised GROW charts is protective, while growth trajectories slower than the 3rd GROW centile, regardless of whether they are SGA at birth, are associated with adverse perinatal outcome.

4.4 | Risk of stillbirth at term associated with small and large for gestational age by customised, World Health Organisation and Intergrowth 21 birthweight centiles

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Objective: We investigated the risk of stillbirth at term by birthweight centile categories using customised, WHO and IG-21 birthweight centiles.

Method: We used data from the Collaborative IPD of Going-to-sleep and Stillbirth (CRIBSS) meta-analysis of studies that collected maternal going-to-sleep position and late stillbirth risk. Inclusion criteria: singleton, non-anomalous pregnancy $\geq 37^0$ weeks' gestation. Birthweight centiles were calculated using customised, WHO and IG-21 bulk calculators. The date the mother believed her baby died was used to estimate gestation, and if this was unknown was estimated as 48 hours before birth. SGA was defined as birthweight <10th and LGA >90th centile. One stage multivariable analysis adjusted for known confounders for stillbirth, including going-to-sleep position.

Results: The study population comprised 467 term stillbirths and 1948 controls with ongoing pregnancies. Of term stillbirths 121 (26%), 88 (19%) and 78 (17%) were SGA by customised, WHO and IG-21 centiles respectively. The aOR for term stillbirth for SGA by customised centiles was 4.16 (2.57, 6.74) by WHO was 3.35 (2.05, 5.48) by IG-21 was 4.43 (2.63, 7.46). The risk of late stillbirth increased as centile reduced by each criterion with birthweight from 10th to 25th centile associated with approximate two-fold increased odds of term stillbirth, regardless of which calculator was used. With customised centiles LGA was associated with increased term stillbirth (aOR 1.88 (1.09, 3.27) but this relationship was not seen with LGA measured by WHO and IG-21 centiles LGA (aOR 0.93 (0.59, 1.47) and aOR 0.69 (0.46, 1.06) respectively.

Conclusions: SGA babies have an approximate 4-fold increased odds of term stillbirth regardless of which centile calculators are used. Birthweight >90th centile at term was associated with increased odds of term stillbirth when using customised centiles, but not when calculated by WHO and IG-21 methods suggesting that babies classified as LGA by these centiles may not be pathologically overgrown. The choice of birthweight centile influences the proportion of term stillbirths described as SGA and impacts on the risk associated with LGA.

4.5 | INTERGROWTH-21 vs. WHO fetal growth charts for the identification of SGA in a population from Latin America

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BCNatal, Hospital Clínic and Hospital Sant Joan de Deu | Universidad de Cartagena, Colombia | GRICIO, University of Cartagena, Colombia | Perinatal y de la Mujer, Cartagena, Colombia | ESE Divina Misericordia Hospital Magangué, Colombia | ESE Clinica Maternidad Rafael Calvo, Colombia | ESE Local Hospital Cartagena de Indias, Colombia.

Objective: To evaluate the performance of the INTERGROWTH 21st (IG21) and World Health Organization (WHO) fetal growth charts for the identification of small-for-gestational age (SGA) newborns in a large cohort of deliveries from five centers across three countries from Latin America.

Methods: Prospectively gathered maternity data of all women who gave birth between 24 - 42 weeks at five obstetric centers across three countries Latin America (Colombia, Peru, Mexico) during the period 2017–2018 (n=32,318 singleton births). Infants were classified as adequate-for-gestational age (AGA) or SGA (birthweight <10th centile) according to IG21 and WHO standards. Next, were compared among the groups of SGA cases identified by each and both standards. In addition, the rate of low Apgar score and cephalization index among SGA groups according to each standard were compared.

Results: The rate of SGA detected by WHO was significantly higher than that detected by IG21st [12.6% (4089/32318) vs. 5% (1619/32318); p<0.001]. There was an important disagreement in the identification of SGA by each growth standard: 2545 (7.87%) SGA cases were identified only by WHO, while 75 (0.23%) SGA cases were identified only by IG-21st standard. Importantly, the rate of low APGAR score at five minutes was significantly higher in SGA cases identified only by WHO compared to those AGA [1.03% vs. 0.61%; p<0.001). Importantly, in SGA cases identified only by WHO ponderal and cephalization indexes were also significantly lower in those cases compared to AGAs, suggesting features of true intrauterine undernutrition in those cases that were assigned as AGA by IG21.

Conclusion: In a large population from Latin America, the WHO fetal growth standard seems to be able to identify more cases of SGA newborns compared to IG21 and those newborns had a similar pattern of intrauterine malnutrition than the cases of SGA identified by both curves.

4.6 | Comparison of population vs. customised birthweight charts in Poland for the prediction of neonatal outcome

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Objective: The choice of growth chart for diagnosis and prediction of outcome is an important aspect of management. There is an ongoing debate whether standard population or customised growth charts should be used. The currently recommended standard by the Polish Neonatal Society is the population-based postnatal Fenton growth chart that uses coefficients from an international population. This was compared with the GROW customised coefficients standard that customises for maternal characteristics using coefficients forom thea Polish population. Both standards were population to test compared for their predictive performance value in the aspect of nepredicting neonatal outcome.

Method: A database of 5,079 routine Polish births was constructed from hospital electronic patient records. Centiles were calculated according to the Fenton and GROW neonatal standards using SGA defined as < 10th centile. The neonatal outcomes compared were stillbirth, NICU admission, neonatal complications and APGAR at 5 minutes score <7. After the removal of uncomplete data 4800 records were used for calculation of customized coefficients for the Polish population. Neonatal outcome was compared depending on detection by customizsed or standard Fenton growth chart was compared using relative risk with 95% confidence intervals and population attributable risk. AGA was used as control.

Results: Customized growth charts identified 12,5% and Fenton growth charts 9,5% as SGA neonates. Results are presented in the table below:

	Stillbirth (/1000)	NICU Admission (%)	Neonatal Complication (%)	APGAR 5 Score < 7 (%)
Cases	13 (2.7)	676 (14.1)	140 (2.9)	13 (0.3)
SGA by GROW only				
n	5 (22.1)	70 (31.0)	25 (11.1)	2 (0.9)
Relative risk (95% CI)	12.6 (4.2 - 38.3)	2.3 (1.9 - 2.9)	4.4 (2.9 - 6.6)	3.7 (0.8 - 16.4)
Population attributable risk %	35,4	5,9	13,8	11,2
SGA by both standards				
n	7 (18.8)	67 (18.0)	14 (3.8)	3 (0.8)
Relative risk (95% CI)	13.8 (4.7 - 40.9)	1.3 (1.0 - 1.6)	1.3 (0.8 - 2.3)	3.6 (1.0 - 12.9)
Population attributable risk %	49,9	2,3	2,4	16,6
SGA by Fenton only				
n	0 (0.0)	4 (4.7)	0 (0.0)	0 (0.0)
Relative risk (95% CI)	-	0.3 (0.1 - 0.9)	-	-
Population attributable risk %	-	0,0	-	-

Conclusions: Customiszed growth charts pereformed significantly better in identifying at-risk neonates in comparison to the Fenton standard which failed to identify neonates significantly at risk of stillbirth, NICU admission and neonatal complications. s. The smallest neonates are at greatest risk of complications and are easily identified by both growth charts. Surprisingly being SGA by a Fenton growth chart but and not ASGA by a customiszed growth charts was a significantly protective factor(RR: 0.3) for NICU admission. , as Fenton growth chart misclassified those neonates.The smallest neonates are at greatest risk of complications and while both charts identified at risk neonates the use of the best neonatal standard is of great importance.

4.7 | Predictive accuracy of customized versus populational twin growth chart for adverse perinatal outcome: a cohort study

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Objective: Twin gestations are undoubtedly associated with higher risk of small-for-gestational-age diagnosis and newborn complications comparing to singletons. Occurrence of fetal growth restriction additionally multiplies the a priori risk of neonatal adverse outcomes. Therefore, the objective of the study was to assess fetal weight in twin gestations in relation to singleton charts and to customized twin charts respectively, followed by a comparison of frequency of neonatal complications in neonates labelled as small-for-gestational-age (SGA) by both methods. On this basis, clinical usefulness of customized curves developed by the Società Italiana di Ecografia Ostetrica e Ginecologica Working Group was tested. Aforementioned normograms development was based on biometric measurements derived from superhealthy pregnancies.

Method: We performed an analysis of twin pregnancy cases with chorionicity established in the first trimester with particular emphasis on postnatal adverse outcomes in newborns classified as small for gestational age (SGA). Neonatal birth weight was comparatively assessed using both singleton and twin growth charts with following percentile estimation and possible hypotrophy diagnosis. Using statistical model, we established a prediction strength of neonatal complications in SGA twins for both methods.

Results: The data set included 322 twin pairs. Pregnancies with unknown chorionicity as well as monochorionic monoamniotic were excluded. 247 cases of dichorionic diamniotic and 75 cases of monochorionic diamniotic gestations were reviewed, mostly in terms of hypotrophy diagnosis and neonatal complications. Utilization of twin-specific normograms was less likely to label twins as SGA, nevertheless, this diagnosis strongly correlated with risk of observing adverse outcomes. Using a chart dedicated for twin pregnancies predicted newborn complications in a SGA group with higher sensitivity and had better positive predictive value regarding postnatal morbidity.

Conclusion: Implementation of the customized charts provides better prognosis of undesirable neonatal events in SGA group comparing to singleton nomograms and consequently might determine neonatal intensive care prenatal approach.

PO

PO 7 | Perinatal mortality and SGA rate according to Hadlock and customised fetal weight standards in a South Asian population

Oliver Hugh | Andre Francis | Jason Gardosi | Perinatal Institute, Birmingham, UK

Objective: Many ultrasound reports in the UK National Health Service still assess estimated fetal weight according to the population based growth curve of Hadlock [1], despite the heterogeneity of the maternity population. We wanted to investigate this standard compared to the RCOG recommended customised standard [2] in the assessment of smallness for gestational age (SGA) and perinatal mortality risk in pregnancies of South Asian mothers.

Method: The population included 160,517 consecutive deliveries of singleton, normally formed pregnancies in the West Midlands, UK between 2009-12. The study cohort consisted of a subset of 10,101 pregnancies of mothers who were of South Asian origin (Indian, Pakistani or Bangladeshi) and had at least one third trimester growth scan. In pregnancies with more than one scan, the last scan was used for analysis, resulting in a median gestational age at scan of 252 days (IQ 242-262). SGA (EFW<10th centile) was assessed by the conventional Hadlock chart as well as the GROW fetal weight chart, customised for ethnic origin as well as maternal height, weight and parity. Perinatal death rates were calculated for the SGA groups defined according to the different standards, with relative risk (RR) and 95% confidence intervals (CI).

Results: There were 35 (3.47 /1000) perinatal deaths within the cohort. According to Hadlock, 1,389 (13.8%) EFW measurements were SGA, compared to 632 (6.3%) with GROW. The SGA cases according to Hadlock included 10 perinatal deaths (RR 2.5, CI: 1.2 – 5.2). 8 of these 10 deaths were SGA according to GROW (RR 4.4,CI: 2.0 – 9.7). There were only two deaths in the 769 of 1,389 (55.4%) cases that had been identified as SGA by Hadlock but not by GROW (RR 0.7, CI 0.2-3.1).

Conclusion: Use of the population-based fetal weight standard of Hadlock more than doubles the number of growth scans of South Asian mothers that are designated SGA; these systematically overestimated cases of SGA represent normal pregnancies with no increase in perinatal mortality risk, and are likely to create unnecessary anxiety and interventions.

References

1. Hadlock FP et al. In utero analysis of fetal growth: a sonographic weight standard Radiology 1991;181:129-133
2. Gestation Related Optimal Weight (GROW) v1.1.10, 2019. www.gestation.net

PO

PO 8 | Customised vs population based fetal weight standards to define small for gestational age as a risk factor at 22 weeks gestation

Oliver Hugh | Andre Francis | Jason Gardosi | Perinatal Institute, Birmingham, UK

Objective: New national recommendations in England state that fetal weight should be estimated at the time of the anomaly scan and, if below the tenth centile of an unspecified standard, should be considered high risk requiring specialist referral. We wanted to investigate the degree of variation that might result when using different standards for fetal weight at early gestations.

Method: The tenth percentile values (p10) according to Hadlock, Intergrowth (IG21) and Customised (GROW) were compared at 22 weeks, the earliest gestational age given in IG21 tables. As the GROW standard varies with maternal physiological characteristics, GROW p10 values were also provided for large and small mothers represented by the upper (75th) and lower end (25th centile) of the interquartile (IQ) range of GROW charts for the UK population. Hadlock and IG21 were compared with GROW at these points and differences calculated as percent variation in SGA rate, based on the standard deviation of the respective distributions.

Results: The 22.0 week values for the 10th centile were 398g for Hadlock, 481g for IG21 and 389 for GROW, with an IQ range of 363-411g (Table). The discrepancy between Hadlock and GROW ranged from -36.8% (SGA underestimated) to +79.0% (over-estimated) by Hadlock compared to GROW. IG21 values substantially overestimated SGA rates across the range of GROW points, from +95.5% to +99.9%.

Table: p10 values customised to small and large mothers, and SGA discrepancy between standards at 22.0 weeks

	25th -75th IQ range of GROW charts		
	Small	Average	Large
GROW p10 (g)	363	389	411
Hadlock p10 (g)	398	398	398
Difference in SGA rate (%)	+79.0	+28.2	-36.8
Intergrowth p10 (g)	481	481	481
Difference in SGA rate (%)	+99.9	+99.1	+95.5

Conclusion: Early pregnancy screening for SGA estimated fetal weight as a risk factor is highly dependent on the standard being used, and may lead to many errors unless it is appropriate for the population and customised for each pregnancy.

PO 9 | Accuracy of Hadlock and Intergrowth formulae for birthweight in pregnancies with suspected late IUGR

Judit Martinez | E Meler | E Eixarch | A Peguero | K Vellve | Francesc Figueras | Hospital Clínic de Barcelona, Spain

Objective: Estimated fetal weight (EFW) has commonly been calculated with Hadlock's formula (H3). However, in the INTERGROWTH-21 (IG-21) study, birthweight (BW) was better estimated as a function of AC and HC, especially in preterm pregnancies. No studies have compared the accuracy of both formulas above 34 weeks in suspected IUGR fetuses. We aim to compare the accuracy of H3 and IG-21 formulas for the estimation of BW in suspected late IUGR.

Method: IUGR pregnancies were defined as EFW <10th centile, above 34 weeks, and with an EFW 2 weeks before the delivery. We used H3 and IG-21 formulas to calculate EFW and compare the accuracy for the estimation of BW. To calculate EFW and BW centile, we used local curves references. We assessed the mean percentage errors (MAPE) (systematic error) and the SD of percentage error (random error). We also assessed the proportion of patients having EFW within 10% discrepancy from BW.

Results: We included 301 pregnancies. The mean gestational age at delivery was 38.5 weeks (SD1.4) and at the last US, 37.6 weeks (SD1.5). The mean BW was 2509 g (SD 374) and the median weight centile at birth 9 (SD11.8). The MAPE was significantly lower in H3 formula compared with IG-21 (-5.3% vs. -10.0%). The random measurement errors were similar, 9.3 vs. 9.9. The ICC between BW and EFW by H3 was higher than between BW and IG-21 (0.706 vs. 0.585, p=0.095). 66.8% and 48.0% of cases were within the 10% discrepancy EFW-BW for H3 and IG-21 formulas respectively (p<0.001). 69.7% EFW<10th centile were finally confirmed at birth. H3 and IG-21 had similar sensibility (94.2% vs. 98.6%) and PPV (71.7% vs. 70.1%) for the prediction of BW<10th centile.

Conclusion:
In suspected late IUGR, H3 formula would be slightly more accurate for the prediction of BW. However, both formulas would predict similarly the existence of BW <10th.

PO 24 | Prescriptive reference standards of third trimester cerebroplacental ratio and its physiological determinants

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Maternal-Fetal Medicine Department, Barcelona Clinic Hospital, University of Barcelona, Spain

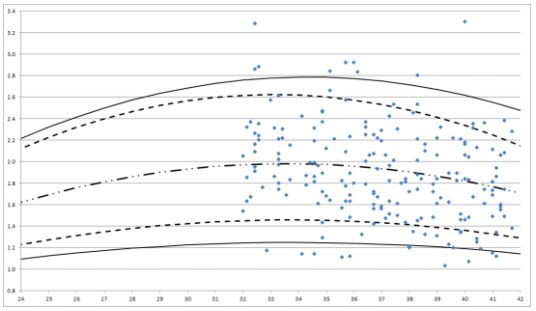
Objective: To construct valid reference standards reflecting optimal cerebroplacental ratio and to explore its physiological determinants.

Methods: A cohort of 391 low-risk pregnancies of was created of singleton pregnancies of non-malformed fetuses without maternal medical conditions and with normal perinatal outcomes. Doppler measurements of the middle cerebral artery and umbilical artery were performed at 24-42 weeks. Reference standards were produced and the influence of physiological determinants was explored by non-parametric quantile regression. The derived standards were validated in a cohort of 200 low-risk pregnancies.

Results: Maternal BMI (body mass index) was significantly associated with the 5th centile of the cerebroplacental ratio. For each additional unit of BMI, the 5th centile was on average 0.014 lower. The derived 5th, 10th and 50th centiles selected in the validation cohort 5%, 9.5% and 51% of the measurements.

Conclusion: This study provides methodologically strong prescriptive standards and suggests that maternal body mass index is a determinant of the cut-offs commonly used for decision-making.

Figure 1. CPR measurements in the validation sample (n=200) plotted against the reference ranges: _____ p5&p95; ----- p10&p90; ____ ·· ___ p50.



Session 5: Antenatal detection of FGR: current strategies

O 5.1 | Small-for-gestational age neonate: what is the benefit of antenatal detection?

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Objective: To assess the benefit of the screening protocol for small-for-gestational-age (SGA) neonates and to evaluate the benefit of antenatal diagnosis of fetal growth restriction (FGR) on obstetric management and neonatal outcome.

Methods: We performed an observational study of a historical cohort of 269.623 structurally and chromosomally normal singletons born in Slovenia from 2002 to 2017. Screening for FGR was performed by the measurement of fundal height starting at 24th gestational week in normal pregnancies and by serial US biometry in high risk pregnancies. We estimated the prevalence of SGA neonates, sensitivity, specificity, positive and negative likelihood ratio (+/-LR), and the Matthews Correlation Coefficient (MCC). We compared SGA neonates (birthweight < 10th percentile), antenatally suspected of FGR (true positive), non-SGA neonates, suspected of FGR (false positive), SGA neonates without suspicion of FGR (false negative) and non-SGA neonates without suspicion of FGR (true negative). Multivariable analyses were performed adjusted for relevant maternal and neonatal characteristics to evaluate the benefit of antenatal diagnosis of FGR for an obstetrical and neonatal outcome.

Results: The prevalence of SGA neonates was 6.87%. Sensitivity and specificity of the screening protocol was 18.29 % and 98.56%, respectively, with +LR of 12.73 and -LR of 0.83. The MCC showed low positive correlation between the screening protocol and diagnosis of SGA (0.27). The results of the comparisons of the obstetrical and neonatal outcomes are presented in Table 1. In suspected SGA, compared with unsuspected SGA neonates, comparable neonatal outcomes were achieved by means of higher rate of caesarean deliveries and preterm births.

Conclusion: Screening for FGR by the measurement of fundal height starting at 24th gestational week in normal pregnancies and by serial US biometry in high risk pregnancies is not beneficial neither for diagnosis of SGA neonates nor for improving their neonatal outcome.

O 5.2 | Improving the detection of fetal growth restriction: evaluation of user experience of an interactive educational program

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Objective: To evaluate user experience of an interactive educational program on fetal growth restriction (FGR).

Method: A four and a half face-to-face workshop has been developed to provide education to clinicians to improve the detection and management of FGR. Evaluation of participant knowledge and confidence of 11 learning objectives was undertaken using a paper based or on-line survey administered immediately before and after the workshop.

Results: 699 participants have attended the 24 workshops held to date. Pre-workshop evaluation surveys were completed by 544 participants; including 475 midwives, 67 doctors and 2 nurse educators. Post-workshop evaluation surveys were completed by 409 participants; including 356 midwives, 51 doctors and 2 nurse educators. A high level of satisfaction was reported for all aspects of the workshop including quality of facilitators, learning resources, relevant content and presentation.

The FGR education program appears to be beneficial in improving clinician knowledge and confidence in the detection and management of FGR across all learning objectives (see figure 1). Overall, 33% of participants reported being confident or extremely confident in best practice for the detection and clinical management of FGR prior to the program and this increased to 89% post-workshop. 93% of participants indicated they would change some aspect of their clinical practice following the workshop.

Conclusions: Improving the detection and care of pregnancies with FGR is an important strategy to reduce adverse outcome and is relevant to all maternity care providers. The FGR education program appears to be beneficial in improving clinician knowledge and confidence in the detection and management of FGR. Participants reported a high level of satisfaction for all aspects of the workshop including quality of facilitators, learning resources, relevant content and presentation format.

O

5.3 | Investigating the utility of the customised fetal growth chart: a randomised controlled trial

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Objective: To determine if the routine use of a customised fetal growth chart, when compared to a standard growth chart, reduces the risk of adverse pregnancy outcome through increased detection of adverse growth.

Method: A double-blind, single centre, randomised controlled trial was conducted. All women with a singleton pregnancy receiving routine antenatal care through hospital clinics were included. Women were randomised 1:1 to either a standard growth chart (SC) or a customised growth chart (CC) that was tailored for maternal size, ethnicity and parity. Serial measurements of symphyseal fundal height were plotted onto the chart in the electronic clinical record; pre-programmed alerts notified the clinician when growth or size required review. The primary outcome measure was a composite perinatal morbidity/mortality outcome consisting of stillbirth, neonatal death, Apgar score at five minutes < 4, neonatal hypoglycaemia, stages 2-3 necrotizing enterocolitis, stages 2-3 hypoxic ischaemic encephalopathy, neonatal seizures, grades 3-4 intraventricular haemorrhage, admission to neonatal nursery > 4 days.

Results: 3993 women were recruited; 1974 (49.4%) to the CC group and 2019 to the SC group. 45.4% of participants were nulliparous; 50.0% Caucasian, 17.8% Asian; 34.9% were overweight or obese prior to pregnancy; and on average aged 30 (standard deviation 5.5) years old. The number of growth alerts ranged from none to a maximum of 15, with a median (interquartile range [IQR]) of 2 (3) for both groups (p=0.378); there was also no difference in the total number of ultrasounds per pregnancy (median [IQR] 3 [2] for both groups, p=0.266). There was no significant difference in primary composite outcome (CC 6.4%, SC 7.5%, p=0.171) or individual components, apart from stillbirth (CC n=1 0.05%, SC n=8 0.4%, p=0.039).

Conclusions: Use of a customised growth chart in conjunction with serial symphyseal fundal height measurements may infer some benefit over that of a standard chart.

O

5.4 | Improved detection of SGA and reduction of stillbirths in England

Sue Turner, Mandy Williams, Oliver Hugh, Jason Gardosi | Perinatal Institute, Birmingham, UK

Background: The Growth Assessment Protocol (GAP) is a national programme which has arisen out of the realisation that the majority of normally formed stillbirths are associated with fetal growth restriction, and that antenatal detection can lead to prevention.

Method: Since 2010/11 GAP has been implemented in 80% of hospitals in the National Health Service (NHS). The programme includes 1. training in early pregnancy risk assessment and assignment of low and high risk surveillance pathways; 2. standardised measurement and plotting of fundal height and scan estimated fetal weight on customised growth charts; 3. evidence based referral protocols for further investigation; 4. audit tools for monitoring antenatal detection rates of SGA babies; and 5. clinical outcome review of missed cases.

Results: 630,377 customised charts have been generated over the last 12 months (2018/19) in NHS units in the GAP programme. Antenatal detection rates of SGA weight at birth rose from an average unit baseline of 19.1% pre-implementation to 42% overall and 62.3% in the top ten units, with false positive rates of 7.0% and 12.2%, respectively. According to Office of National Statistics data fir England, stillbirth rates have dropped year on year since 2011 to 4.01/1000 in 2018. This represents a 25% reduction in stillbirths compared to the previous 10 year (2000-2009) average of 5.35/1000. The proportion of SGA stillbirths dropped from 39.4% in 2015/16 to 29.8% in 2018/19; p=0.02.

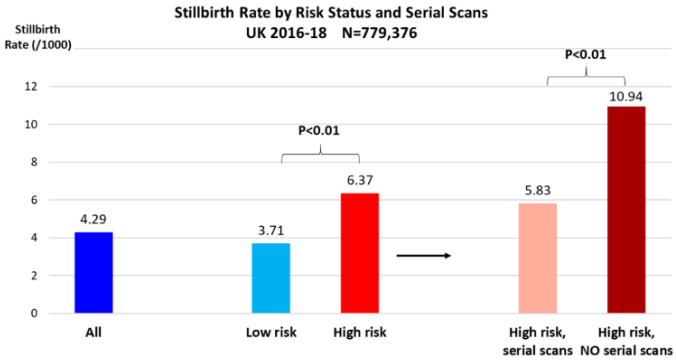
Conclusions: Improved antenatal detection of SGA pregnancy has been associated with substantial reductions in stillbirth. The extent of the benefit is related to local effort, adherence to protocols and availability of resources.

5.5 | Effect of serial scanning in high risk pregnancy on risk of stillbirth

Oliver Hugh | Sue Turner | Amanda Williams | Jason Gardosi | Perinatal Institute, Birmingham, UK

Objective: Guidelines from RCOG, NHS England and the Perinatal Institute's Growth Assessment Protocol (GAP) all recommend that pregnancies considered high risk at booking should have serial growth scans in the third trimester of pregnancy. We wanted to determine the stillbirth rate in pregnancies designated as high risk, and the effect that serial scans had on stillbirth risk.

Method: We studies a cohort of 779,376 deliveries with anonymised data collected routinely between January 2016 and September 2018 by UK Trusts and Health Boards in the GAP program. Data recorded included risk classification at the beginning of pregnancy and whether serial scans had been instituted, as well as pregnancy outcome. Stillbirth risk was calculated by relative risk (RR) and 95% confidence interval (CI).



Results: There were 3,347 stillbirths during the study period which gave an overall rate (per thousand) of 4.3. A total of 172,494 (22.1%) pregnancies were classified as high risk, of which 1,098 ended in stillbirth (rate 6.4); this compared with 2,249 stillbirths in 606,882 pregnancies designated low risk (rate 3.7; RR 1.7 , CI 1.6 – 1.8). Of the high risk pregnancies, 154,400 (89.5%) received serial scans, and included 900 stillbirths (rate 5.8, RR 1.6, 1.5 – 1.7). The remaining 18,094 (10.5%) of the high-risk deliveries had no serial scans, and 198 of these pregnancies ended in stillbirth (rate 10.9; RR 1.9, CI 1.6 – 2.2). The Figure illustrates the stillbirth rates in the various categories.

Conclusion: The majority of high risk pregnancies in the GAP program receive serial scans in the third trimester as per guidelines. Failure to provide serial scans is associated with a near-doubling of stillbirth risk.

5.6 | Implementing comprehensive fetal growth surveillance: GAP India

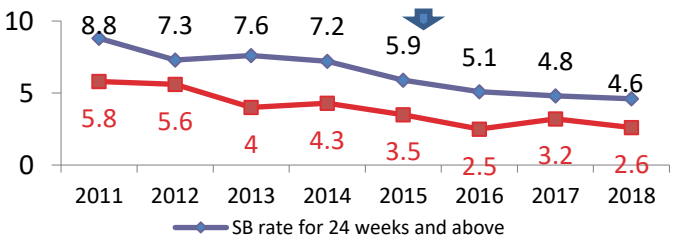
Nuzhat Aziz | Fernandez Hospital Network, Hyderabad, India

Objective: To determine the effect of the Growth Assessment Protocol (GAP) on stillbirth rates.

Method: Prospective interventional observational study at a tertiary referral perinatal centre in southern India with about 9000 births per year, from April 2015 to December 2018. Indian customized fetal growth centiles were created by the Perinatal institute, Birmingham UK using the local data. The entire staff involved in obstetric antenatal care were certified in the Growth Assessment Protocol (GAP), before applying to all women who had booked for care at the institute. Multifetal pregnancies and referred women were excluded. The antenatal SGA detection rates were determined prior to application of GAP and re-assessed at regular intervals throughout the study period. The primary outcome was stillbirth rates and secondary outcomes were incidence of SGA, antenatal SGA detection rates, SGA related stillbirth rates and reasons for failing to detect FGR. Stillbirth rates were defined for more than 24 and more than 28 weeks.

Results: There were a total of 22,680 singleton births that had antenatal care in the study period. Still birth rates decreased from 5.9 to 4.6 per 1000 for those above 24 weeks of gestation and from 3.5 to 2.6 per 1000 for those above 28 weeks of gestation as chart in the chart. The incidence of SGA was 10.02% and FGR detection rates in our institute increased from 45% to 76.5%.

Conclusion: GAP resulted a reduction of stillbirth rate as the detection of SGA in antenatal period increased.



O

5.7 | Growth Assessment Protocol (GAP) increased detection of SGA babies and reduced neonatal morbidity at New Zealand tertiary maternity hospital

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Objective: To determine the effect of GAP on detection of SGA, induction of labour, caesarean birth and composite adverse neonatal outcome defined as admission to the neonatal unit for >48 hours, Apgar score <7 at 5 minutes or any ventilation.

Methods: Detection of SGA among women booked under hospital care with singleton, non-anomalous pregnancy was compared between pre-GAP (2012, n=1105) and post-GAP (2017, n=1082) epochs. Analyses were adjusted for potential confounding by maternal age, BMI, deprivation, smoking and ethnicity. Epoch exposure effect was compared among clinical subgroups by an interaction test.

Results: SGA rates were similar across epochs (13.8% vs 12.9%, p=0.68) but antenatal detection of SGA increased from 22.9% (33/153) to 57.9% (81/140) after introduction of GAP (aOR=4.8, 95% CI 2.82, 8.18). Detection of SGA was similarly improved in women with and without obesity but the increase was greater in Maori and Pacific Island women (18.9% vs 63.8%) compared with women of other ethnicities (28.6% vs 52.1%) (interaction p=0.049). Induction of labour and caesarean birth increased between epochs, but increases were similar among SGA and non-SGA groups and among those with identified and non-identified SGA. Among those with SGA, increased antenatal identification of SGA post-GAP appeared to be associated with lower composite adverse neonatal outcome (identified SGA: 32.4% pre-GAP vs 17.5% post-GAP, aOR=0.44, 95%CI 0.17, 1.1.5; non-identified SGA: 12.3% vs 19.3%, aOR 1.81, 95%CI 0.73, 4.48; interaction p=0.03) and reduced neonatal unit admission (identified SGA: 29.4% pre-GAP vs 16.3% post-GAP, aOR=0.42, 95%CI 0.15, 1.15; non-identified SGA 9.6% pre-GAP vs 15.8% post-GAP, aOR=1.86, 95%CI 0.63, 5.52; interaction p=0.04).

Conclusions: Implementation of GAP in a multi-ethnic population with high obesity was associated with a 5-fold increase in SGA detection without increasing obstetric intervention for SGA, and was associated with reduced rate of prolonged neonatal admission amongst infants identified as SGA.

O

5.8 | GAP protocol – reducing stillbirths through improved identification of FGR – the Hull experience

Robin Hughes | J Atkinson | M Mohan | U Rajesh | Hull University Hospitals NHS Trust, UK

Background: The most recent MBRRACE report (2014-16) details a slight decline in UK stillbirth rates with the figure now standing at 3.93 per 1,000 births. In the same period in Hull and East Yorkshire, the stillbirth rate was 16% higher than this at 4.56 per 1,000 births (standardised and adjusted). Sadly, most stillbirths remain unexplained. However, the majority within this group show evidence of fetal growth restriction (FGR) and are therefore potentially amenable to antenatal detection with appropriate monitoring. The Growth Assessment Protocol (GAP) offers a rigorous and standardised approach to offering ultrasound scans to improve detection rates.

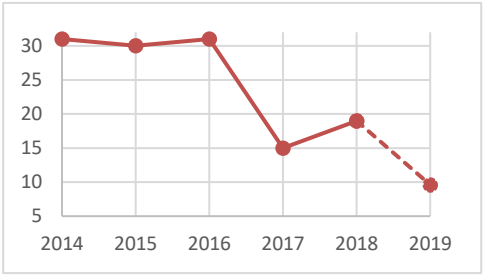
Objective: To further reduce the stillbirth rate in Hull through the sustainable implementation of GAP.

Method: Hull University Hospitals introduced a modified GAP protocol in 2016 and extended this to full GAP in 2018. Following an assessment of risk factors for FGR, women are allocated to either:

a) Low risk cohort - Standardised fundal height measurements

b) High risk cohort - Serial ultrasound scans at 28, 31, 34, 37 and 40 weeks gestation

Suspicion of FGR on ultrasound prompts obstetric review. Management options include further monitoring and/or delivery (at term or earlier if indicated).



Results: Absolute stillbirth numbers have fallen sharply since the introduction of GAP. It is likely that this significant improvement is not solely attributable to GAP but also reflects the concerted efforts of medical, midwifery and ultrasonography teams.

Conclusion: Implementation of GAP has contributed to a dramatic fall in stillbirth numbers in Hull and East Yorkshire. However, the increased number of ultrasound scans presents a challenge to resource provision and therefore ongoing service evaluation is essential.

Session 6: Hypertension, fetal growth and markers of angiogenesis

K

6.1 | Fetal growth patterns in hypertensive disorders of pregnancy: NICHD fetal growth studies

Roger Newman[1] | Julio Mateus[1] | Cuilin Zhang[2] | Sarah J. Pugh[2] | Jagteshwar Grewal[2] | Sungduk Kim[2] | William A. Grobman[3] | John Owen[4] | Anthony C. Sciscione[5] | Ronald J. Wapner[6] | Daniel Skupski[7] | Edward Chien[8] | Deborah A. Wing[9] | Angela C. Ranzini[10] | Michael P. Nageotte[11] | Nicole Gerlanc[12] | Paul S. Albert[2] | Katherine L. Grantz[2] |
Division of Maternal-Fetal Medicine, Medical University of South Carolina, USA; Division of Intramural Population Health Research, Eunice Kennedy Shriver National Institute of Child Health and Human Development, NIH, Bethesda, MD, USA

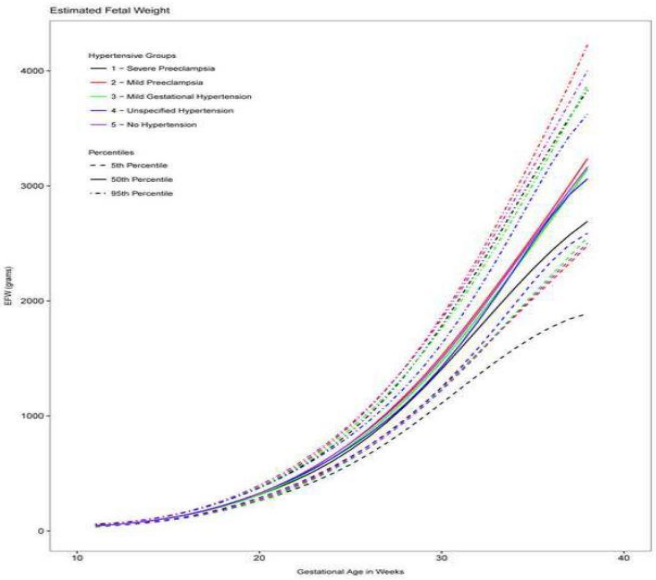
Background: The relationship between hypertensive disorders of pregnancy with fetal growth restriction is poorly understood since prospective longitudinal data are lacking.

Objective: To compare longitudinal fetal growth trajectories between women with normotensive pregnancies and those with hypertensive.

Study Design: Prospective longitudinal cohort study of fetal growth performed at 12 U.S. sites (2009-2013). Gestational age confirmed by ultrasound between 8w0d and 13w6d and up to six ultrasounds performed across gestation. Hypertensive disorders were abstracted from the medical record and grouped based on discharge diagnosis as severe preeclampsia (including eclampsia or HELLP syndrome), mild preeclampsia, severe and mild gestational hypertension, or unspecified hypertension. Pregnancies without hypertensive disorder constituted the nc hypertension group. Growth curves for EFW and individua biometric parameters including BPD, HC, AC, femur anc humerus length were created for each group using linea mixed models with cubic splines. Global and weekly pairwise comparisons were performed comparing hypertensive and no hypertension groups for differences while adjusting for confounding variables. Delivery gestational age and birthweights were also compared.

Results: Of 2,462 pregnancies, 2296 (93.3%) had nc hypertension, 63 (2.6%) mild gestational hypertension, 54 (2.2%) mild preeclampsia, 32 (1.3%) severe preeclampsia and 17 (0.7%) unspecified hypertension. Compared with nc hypertension, women with severe preeclampsia had EFW that was reduced between 22 and 38 weeks (all weekly pair wise P values <.008). Women with severe preeclampsia also had significantly smaller AC between 23 to 31 and 33 to 37 weeks' gestation (weekly pair-wise P values <.04). Scattered weekly growth differences were also noted for other biometric parameters between these two groups. The consistent differences in EFW and AC were not noted between women with other hypertensive disorders of pregnancy and those with no hypertension. Women with severe preeclampsia delivered significantly earlier (mean 35.9 +/- 3.2 weeks) than the other groups (global P<.0001) and had significantly lower birthweights (-949.5 g (95% CI -1117.7, -781.2 g); P<.0001).

Conclusion: Among women with hypertensive disorders of pregnancy, only those destined to develop severe preeclampsia demonstrated significant and consistent reductions in fetal growth (i.e., smaller EFW and AC) compared to no hypertension.



O

6.2 | Placental weight in preeclamptic and growth-restricted pregnancies in correlation to the maternal sFlt-1/PlGF serum concentration and doppler findings

Lisa Dröge | Lisa Frank | Natalia Stütz | Anna Gafron | Wolfgang Henrich | Stefan Verlohren |
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Objective: A significantly elevated sFlt-1/PlGF ratio in the serum of patients with preeclampsia (PE) and intrauterine fetal growth restriction (IUGR) indicates a placental dysfunction with impaired microarchitecture of the placenta. However, there is still a poor understanding about the linear correlation between the sFlt-1/PlGF level causing the symptoms of a PE; the Doppler findings of the uterine and umbilical artery indicating a PE and IUGR and the placental mass. The aim of this study was to evaluate the correlation of these clinically measurable parameters in healthy pregnancies and those with PE and IUGR.

Methods: We included n=45 controls, n=137 cases with PE, n=40 with IUGR and n=26 with PE+IUGR with available sFlt-1/PlGF ratio 14 days prior to delivery between 07/2010 and 03/2018 in our outpatient clinic. The correlation between the placental mass, sFlt-1, PlGF and the pulsatility indices (PI) of the umbilical- and uterine arteries were investigated using a bivariate correlation correcting for gestational age. In a second step, we compared the sFlt-1, PlGF and sFlt-1/PlGF level per gram placental weight in the subgroups.

Results: In contrast to controls, cases with a PE-associated outcome showed a significant linear correlation between placental mass and PlGF level (PE: r=0.440, p<0.01, IUGR: r=0.328, p=0.041, PE+IUGR r=0.719 p<0.01, Controls: r=-0.037, p=0.808). In PE+IUGR, the sFlt-1 level also correlated with the placental weight (r=0.516, p=0.007).
A tendency to a negative correlation between the PI of the uterine arteries and the placental mass could be demonstrated in controls (r=-0.497 p=0.06) and PE (r=0.212 p=0.066). Interestingly, this correlation was significant in cases with PE+IUGR (p=-0.598, p<0.01) and IUGR (p=-0.491 p=0.039). The PI of the umbilical artery showed a negative correlation with the placental mass in IUGR+PE (r=-0.616, p<0.01) and PE (r=-0,272,p<0.01), but not in controls.
The sFlt-1/PlGF ratio per g placenta was seven times higher in PE (0.70 ± 1.39, <0.001), 0.85 ±1.89, <0.001 in IUGR and fourteen times higher in PE+IUGR (1.37 ± 1.56, <0.001) when compared to Controls (0.10 ± 0.155).

Conclusion: The clear correlation between PlGF and the placental mass, the negative correlation between the placental mass and the PI of the uterine arteries in PE, IUGR and PE+IUGR and the clearly shifted level of sFlt-1/PlGF per gram placental mass in the diseased cohorts reflect the pathology of the placental architecture and support the concept of an angiogenic continuum.

O

6.3a | Maternal serum levels of sFlt-1 and PlGF in a low-risk population of pregnant women in predicting delivery of an SGA newborn

Marek Lubusky[3] | L Roubalova[1] | K Langova[2] | V Kroutilova[3] | V Durdova[3] | T Kratochvilova[3]
[1]Department of Clinical Biochemistry, [2]Department of Medical Biophysics and [3]Department of Obstetrics and Gynecology, Palacky University Olomouc, University Hospital Olomouc, Czech Republic

Objective: The aim of the study was to assess maternal serum levels of PlGF, sFlt-1 and the sFlt-1/PlGF ratio in a low-risk population of pregnant women and evaluate the cut-off value in predicting delivery of an SGA newborn.

Methods: In a prospective cohort study, in a group of 476 pregnant women with singleton pregnancies and term delivery (≥37th week), maternal serum PlGF and sFlt-1 were assessed using the Thermo Fisher assays on a Kryptor Compact platform. PlGF was assessed three times (at 9–13, 30–33 and 36–37 gestational weeks) and sFlt-1 two times (at 30-33 and 36–37 weeks) and the sFlt-1/PlGF ratio was calculated. Newborn weight centiles were evaluated according to INTERGROWTH-21 standards. A receiver operating characteristic (ROC) analysis was used to determine the threshold of the PlGF and sFlt-1 levels and sFlt-1/PlGF ratio in predicting delivery of an SGA newborn.

Results: SGA (birth weight <10th centile) was diagnosed in 6.3% of the newborns (30/476) and 1.1% (5/476) had a birth weight <3rd centile. ROC analysis showed that none of the parameters were able to predict delivery of SGA <10th centile, the area under the curve (AUC) was poor for all parameters regardless of gestational age and did not exceed a level of 0.75. In the group SGA <3rd centile, ROC analysis showed good accuracy for PlGF in the 3rd trimester, at 30-33 weeks (AUC = 0.80), and particularly at 36-37 weeks (AUC = 0.81). The optimal PlGF cut-off at 30-33 weeks was 223 with sensitivity 80% and specificity 80% and at 36-37 weeks cut-off 76 with sensitivity 85% and specificity 80%, respectively.

Conclusions: Maternal serum PlGF in the 3rd trimester, particularly at 36-37 weeks, can predict the delivery of an SGA <3rd centile at term, but not <10th centile, and neither sFlt-1 nor sFlt-1/PlGF ratio improve prediction.

O

6.3b | Maternal serum levels of PlGF and sFlt-1 in a low-risk population of pregnant women in the third trimester in predicting fetal growth restriction

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[1]Department of Clinical Biochemistry, [2]Department of Medical Biophysics and [3]Department of Obstetrics and Gynecology, Palacky University Olomouc, University Hospital Olomouc, Czech Republic

Objective: The aim of the study was to assess maternal serum levels of PlGF, sFlt-1 and the sFlt-1/PlGF ratio in a low-risk population of pregnant women in the third trimester and evaluate the cut-off value in predicting FGR.

Methods: In a prospective cohort study, in a group of 443 pregnant women with singleton pregnancies, maternal serum PlGF and sFlt-1 were assessed using the Thermo Fisher assays on a Kryptor Compact platform. PlGF and sFlt-1 were assessed two times (at 30–33 and 36–37 gestational weeks) and the sFlt-1/PlGF ratio was calculated. FGR was diagnosed according to the Consensus definition of fetal growth restriction: a Delphi procedure. A receiver operating characteristic (ROC) analysis was used to determine the threshold of the PlGF and sFlt-1 levels and sFlt-1/PlGF ratio in predicting FGR.

Results: FGR was diagnosed in 5.6% of pregnant women (25/443), early-FGR (<32 weeks) in 0.9% (4/443) and late-FGR (≥32 weeks) in 4.7% (21/443). ROC analysis showed that none of the parameters were able to predict FGR, the area under the curve (AUC) was poor for all parameters regardless of gestational age and did not exceed a level of 0.70. Only in the group Early-FGR, ROC analysis showed fair accuracy for PlGF in the 3rd trimester, at 30-33 weeks (AUC = 0.77), and at 36-37 weeks (AUC = 0.78), but with low statistical significance (p >0.058), because the group was too small, and the optimal PlGF cut-off could not be evaluated.

Conclusions: Maternal serum PlGF in the 3rd trimester could predict the Early-FGR, but neither sFlt-1 nor sFlt-1/PlGF ratio improve prediction.

O

6.3c | Maternal serum levels of PlGF and sFlt-1 in a low-risk population of pregnant women in the third trimester in predicting preeclampsia

Marek Lubusky[3] | L Roubalova[1] | K Langova[2] | V Kroutilova[3] | V Durdova[3] | T Kratochvilova[3]

[1]Department of Clinical Biochemistry, [2]Department of Medical Biophysics and [3]Department of Obstetrics and Gynecology, Palacky University Olomouc, University Hospital Olomouc, Czech Republic

Objective: Angiogenic factors (PlGF - placental growth factor, sFlt-1 - soluble fms-like tyrosine kinase 1) play a key role in the pathogenesis of preeclampsia (PE). The aim of the study was to assess maternal serum levels of PlGF, sFlt-1 and the sFlt-1/PlGF ratio in a low-risk population of pregnant women in the third trimester and evaluate the cut-off value in predicting PE.

Methods: In a prospective cohort study, in a group of 482 pregnant women with singleton pregnancies, maternal serum PlGF and sFlt-1 were assessed using the Thermo Fisher assays on a Kryptor Compact platform. PlGF and sFlt-1 were assessed two times (at 30–33 and 36–37 gestational weeks) and the sFlt-1/PlGF ratio was calculated. PE was diagnosed according to the International Society for the study of Hypertension in Pregnancy. A receiver operating characteristic (ROC) analysis was used to determine the threshold of the PlGF and sFlt-1 levels and sFlt-1/PlGF ratio in predicting PE.

Results: PE was diagnosed in 1.2% of pregnant women (6/482) at 34-40 gestational weeks (median 38w 1d) and delivered in one week after diagnosis. ROC analysis showed that all parameters were able to predict PE in both gestational periods. AUC (area under the curve) was excellent for all parameters regardless of gestational age and exceeded a level of 0.90. The greates accuracy was found for the sFlt-1/PlGF ratio, at 30-33 weeks (AUC = 0.96), and particularly at 36-37 weeks (AUC = 0.97). The optimal sFlt-1/PlGF ratio cut-off at 30-33 weeks was 13 with sensitivity 100% and specificity 94% and at 36-37 weeks cut-off 86 with sensitivity 100% and specificity 95%, respectively.

Conclusions: Maternal serum levels of PlGF and sFlT-1 in a low-risk population of pregnant women in the third trimester can predict PE, particularly the sFlt-1/PlGF ratio, but the cut-off value increases with gestational age.

O

6.4 | Maternal and perinatal outcomes in growth restricted fetuses with extremely high sFlt-1 to PlGF ratio

Manel Mendoza | I Herraiz I | L Valle | M Vázquez-Fernandez | A Fernandez-Oliva | S Caamiña | JL Delgado | I Melchor | J Uriarte | C Villalaín | A Galindo | Hospital Universitari Vall d'Hebron, Barcelona | Hospital Universitario 12 de Octubre, Madrid | Hospital Universitario maternoinfantil de Canarias, Las Palmas | Hospital Universitario Central de Asturias, Oviedo | Hospital Universitari de la Sta Creu i St Pau, Barcelona | Hospital Universitario Ntra Sra de Candelaria, Tenerife | Hospital Clínico Universitario Virgen de la Arrixaca, Murcia | Hospital Universitario Cruces, Bilbao

Objective: To describe maternal and perinatal adverse outcomes in singleton pregnancies with severe fetal growth restriction (FGR) determined by extremely high values (>655) of the sFlt-1/PlGF ratio.

Methods: We present a multicentric retrospective cohort study of 178 cases with a determination of sFlt-1/PlGF >655 at the time of FGR diagnosis. Nine Spanish hospitals contributed to the study. Current protocols were followed for delivery indication. Prenatal maternal and fetal characteristics were evaluated, as well as time-to-delivery and perinatal outcomes.

Results: The main characteristics of the study population are shown in Table 1. Mean (SD) gestational age (GA) at diagnosis and at delivery were 28.5 weeks (3.7) and 29.7 weeks (3.4), respectively. FGR severity was assessed and classified from stage I to IV at every ultrasound, showing that severity increased progressively (Table 1). Preeclampsia was present in 146 (82.0%) pregnancies at the time of FGR diagnosis, 67 (45.9%) fulfilling severity criteria. Median latency interval (days) from sFlt-1/PlGF>655 until delivery was 3 days (IQR: 1-7) being significantly shorter in patients with concurrent preeclampsia at diagnosis (Table 1). Elective delivery was required in the majority of pregnancies (98.3%) being cesarean section the most frequent mode of delivery (83.1%) and maternal placenta-related complications the most frequent indication (51.7%). Pregnancy complications stratified by GA at diagnosis are depicted in Figure 1 and 2. Perinatal mortality was high when sFlt-1/PlGF>655 was found <24 weeks and severe morbidity and mortality surpassed 50% of cases delivered <29 weeks. Perinatal outcomes substantially improved at ≥29 weeks; however, placenta-related maternal complications were present in around 25% of pregnancies regardless of GA for sFlt-1/PlGF assessment.

Conclusions: A sFlt1/PlGF value >655 is associated to a short time-to-delivery due to both maternal and fetal complications that require immediate delivery. After obtaining such high values, clinicians should monitor these pregnancies closely or even consider fetal maturation.

O

6.5 | Prediction of elective delivery in SGA and FGR

Manel Mendoza | Pablo Garcia-Manau | Erika Bonacina | Berta Serrano | Helena Tur | Nerea Maíz | Elena Carreras | Hospital Universitari Vall d'Hebron, Barcelona, Spain

Objective: To describe the capacity of maternal characteristics, feto-placental circulation, esti-mated fetal weight (EFW) and angiogenic factors to predict delivery at <34 weeks of gestation (WG) and delivery at <37 WG.

Methods: This is a prospective observational study carried out at Vall d'Hebron University Hos-pital that included pregnancies with ultrasonographic EFW<10th percentile in which we recorded maternal characteristics related to the risk of preeclampsia (NICE guide-lines), feto-placental Doppler, EFW, gestational age (GA) and angiogenic factors (sFlt-1/PlGF) at the time of diagnosis. Fetuses were classified as small for gestational age (SGA) or fetal growth restriction (FGR) depending on EFW percentile and feto-placental circulation (Figueras F, DT al. Fetal Diagn Ther. 2014). Additionally, fetuses with FGR were classified into 4 stages (I to IV). When diagnosis of SGA or FGR was made at <32 WG, they were classified as early-onset.

Results: We included 249 pregnancies with SGA (53; 21.3%) or FGR (196; 78.7%), being 172 (69.1%) early-onset. Stage I FGR was the most frequent diagnosis (180; 72.3%) at inclusion. Median (IQR) GA at diagnosis was 28.6 weeks (24.6-33.0) and median (IQR) GA at delivery was 37.1 weeks (34.1-38.6). Elective delivery at <37 WG was required in 94 cases (37.8%) and in 55 cases (22.1%) at <34 receiver operating char-acteristic areas under the curve (AUC) to predict delivery at <34 WG and at <37 WG were calculated for the combination of all markers showing that the predictive capaci-ty for delivery at <34 WG (0.970, 95% CI:0.949-0.991) was higher than for delivery at <37 WG (0.908, 95% CI: 0.868-0.948). When we compared the predictive capacity of each marker individually, we observed that all markers showed moderate-to-high predictive capacity, being sFlt-1/PlGF with the greater AUC for delivery at <34 WG and at <37WG (0.926 and 0.878, respectively). Additionally, the AUC of this single marker did not differ significantly from that of the combination of all markers (p>0.05). In early-onset cases, when sFlt-1/PlGF at diagnosis was <38, the negative predictive value (NPV) for delivery at <34WG was 93.9%. In late-onset cases, when the sFlt-1/PlGF at diagnosis was <38, the NPV was 91.7% for delivery at <37WG.

Conclusions: The need for elective delivery below 34 and 37 WG can be accurately predicted since SGA or FGR diagnosis. A single determination of sFlt-1/PlGF at diagnosis has similar performance to that of the combination of all markers. A sFlt-1/PlGF < 38 has a high NPV for elective delivery in early- and late-onset cases. Our results could be helpful to counsel patients with diagnosis of SGA or FGR at any stage or gestacional age at diagnosis.

PO 22 | Angiogenesis markers in ultrasound-confirmed late-onset fetal growth restriction, and their utility in determining the neonatal outcome

Magdalena Bednarek-Jędrzejek | Sebastian Kwiatkowski | Joanna Ksel-Hryciów | Piotr Tousty | Barbara Michalczyk | Michał Sławiński | Andrzej Torbe | Pommeranian Medical University in Szczecin, Department Obstetrics and Gynecology, Poland

Objective: As of yet, no golden standard has been developed for diagnosing late-onset FGR fetuses. We undertook an attempt to assess whether disordered angiogenesis markers, i.e. sFlt-1 and PlGF, combined with ultrasound parameters would allow for identifying late-onset FGR cases, which would then facilitate choosing the appropriate moment for pregnancy termination for the purpose of avoiding poorer perinatal outcomes.

Methods: 120 patients divided into three groups: Group 1 patients with intrauterine fetal growth restriction after 32 weeks' gestation diagnosed using ultrasound parameters. The criteria used for the study were those proposed by Gordijn et al. Group 2 with SGA). Group 3 49 patients with physiological pregnancies. For each of the patients, sFlt-1 and PlGF were determined, and the sFlt-1/PlGF ratio was calculated. Additionally, the Group 1 patients were divided according to their PlGF values: 26 of them had a PlGF<100 andthe remaining 25 had a PlGF>100.

Results: Only 49% of the neonates from the late-onset FGR group diagnosed using ultrasound parameters were born with a neonatal weight of less than the 10th percentile. For this group, we identified significant correlations between the PlGF levels and the ultrasound parameters, because the lower the PlGF was, the higher theUA PI(R=-0.33; p<0.05), the lower the CPR (R=0.30; p<0.05) and the lower the neonatal weight (R=0.4; p<0.05) were. In the group of patients with the so-called low PlGF, neonatal weights were significantly lower(p<0.01). A neonatal weight of less than the 10th percentile was identified in as many as 76% patients with PlGF values of less than 100 pg/ml, and in only 23% of those patients whose PlGF values exceeded 100 pg/ml.

Conclusions: 1. Ultrasound parameters, including those obtained from Doppler ultrasound, are insufficient in predicting low neonatal weights. 2. PlGF correlates significantly with the ultrasound parameters on the basis of which we diagnose late-onset intrauterine growth disorders, and with the neonatal weight.

PO 23 | sFlT1-PlGF ratio in early vs. late FGR

Tânia Meneses | Catarina Palma dos Reis | Bruno Carrilho | Natacha Oliveira | Ana Teresa Martins | Ana Campos | Maternidade Dr. Alfredo da Costa, Centro Hospitalar Universitário Lisboa Central, Portugal

Objective: Pre-eclampsia (PE) and fetal growth restriction (FGR) share a common pathway of placental hypoperfusion. Although in PE the sFlT1-PlGF ratio is elevated, its association with FGR is unclear.

Methods: We conducted a three-year prospective observational study of singleton gestations diagnosed with FGR (EFW and/or AC<10th centile), managed according to our protocol and delivered in our center. Fetuses with chromosomal abnormalities were excluded. Diagnosis before 32 weeks was considered early-onset FGR. Data was obtained from Astraia® and clinical files.

Results: We analysed 159 gestations with sFlT1-PlGF measurement at diagnosis of FGR, of which 93 (58%) were early FGR (EFGR), and the remaining 66 (42%) were late FGR (LFGR). Mean gestational age (GA) at diagnosis was 30.1 weeks (28.4 weeks for EFGR and 34.7 weeks for LFGR). EFGR cases had a significantly higher mean sFlT1-PlGF ratio than LFGR (116.9 and 48.3, respectively, p < 0,001). Pregnancies affected by EFGR had more than three-fold increase of ratio values above the diagnostic cut-offs for PE (OR 3.45; 95% CI: 1,4 – 8,5).

Conclusions: sFlT1-PlGF ratio was consistently elevated at the diagnosis of FGR. As seen in preeclampsia, the magnitude of the increase seems to be proportional to the severity of FGR.

Session 7: Ultrasound and Doppler - new insights for management

K

7.1 | Planning surveillance intervals and timing delivery in early onset IUGR

Ahmet Baschat | Johns Hopkins University, Baltimore, USA

The gestational age window for the management of early onset fetal growth restriction extends from fetal viability to 32-34 weeks gestation. This gestational age is characterized by a significant increase in morbidity free survival per day gained in utero which also translates itself into improved neurologic outcomes at age 2. This constellation of prematurity-related risks establishes a management focus that is characterized by safe pregnancy prolongation until delivery thresholds are met. During the period of fetal surveillance the fetus is at risk for stillbirth. This risk is determined by the rate of progression of placental dysfunction and degree to which fetal status is affected. Observational studies have established that the speed of fetal deterioration is determined by the rate of loss of umbilical artery end-diastolic velocity. Fetal compromise is manifested in several surveillance modalities including Doppler parameters, fetal heart rate monitoring and biophysical profile score. Because deterioration of fetal status is reflected independently in these surveillance modalities, observational and randomized trials have shown that concurrent monitoring using Doppler and a biophysical parameter (fetal heart rate or biophysical profile scoring) provides the most appropriate "safety net" to prevent unanticipated demise. Using such an approach fetal delivery criteria include abnormal fetal heart rate short term variation, fetal heart rate decelerations and an abnormal biophysical profile score irrespective of gestational age. Prior to 30 weeks gestation the primary Doppler parameters that trigger delivery are late changes in the ductus venosus (absent/reversed a-wave. From 30 weeks onward reversed umbilical artery end-diastolic velocity is a delivery indication and from 32 weeks onward absent end-diastolic velocity. In fetuses that have not yet met delivery criteria surveillance intervals need to be based on umbilical artery end-diastolic velocity, elevated ductus venosus Doppler index or amniotic fluid volume. An integrated management approach considering all of these variables is presented in this lecture.

K

7.2 | Planning surveillance intervals and timing delivery in late onset IUGR

Francesc Figueras | University of Barcelona, Spain

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.

PO

PO 25 | Pregnancy outcomes with raised umbilical artery doppler pulsatility index identified before 32 weeks gestation

Andrew Sharp | U Agarwal | A Chopra | K Navaratnam |
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Objective: Fetal growth restriction (FGR) is associated with significant perinatal morbidity and mortality. Current management rests on ultrasound detection and close surveillance to appropriately time delivery. We aimed to analyse pregnancy outcomes for women with raised umbilical artery Doppler pulsatility indexes (UAPI) identified before 32 weeks with protocol-driven management based on TRUFFLE study parameters.

Method: Retrospective cohort study November 2014-2018, in Liverpool Women's Hospital tertiary fetal medicine unit, within the weekly fetal growth clinic. Electronic searches of fetal medicine, obstetric and neonatal case-notes were carried out.
Singleton pregnancies <32+0 weeks with UAPI >95th centile for gestational age (GA) were included, pregnancies with chromosomal/genetic, structural abnormalities or fetal infections were excluded.
Outcomes were; intrauterine fetal deaths and serious neonatal morbidity (bronchopulmonary dysplasia, hypoxic ischaemic encephalopathy, retinopathy of prematurity, necrotising enterocolitis, intraventricular haemorrhage) and mortality. Descriptive statistical analyses were performed with Excel.

Results: 150 cases were identified, 121 remained after exclusions. Median GA at identification was 29+5 weeks (range 23+5-31+4) with median pre-delivery surveillance of 21 days (range 0-96). Dopplers deteriorated in 30% (n=36) during surveillance. Prior to delivery/termination, 26% (n=31) had absent end-diastolic flow (AEDF), 17% (21) had reversed umbilical artery end-diastolic flow (REDF). 79% (n=96) had ductus venosus Dopplers (DV), 6% (n=6) each with absent and reversed A-wave.
2% (n=2) terminated for severe early onset FGR, 3% (n=4) died in-utero, all with AEDF/REDF or reversed DV A-waves. 16% (n=18) of neonates suffered serious morbidity/mortality, 26% with (n=8) AEDF, 35% (n=6) with REDF, 40% (n=2) with absent DV A-wave, and 50% (n=2) with reversed A-wave.

Conclusions: Fetuses under surveillance with AEDF/REDF were delivered <34 weeks and <32 weeks, respectively, in compliance with our protocol. We identified significant morbidity/mortality, emphasising the need for balanced counselling when aiming to prolong pregnancy. This dataset is being developed to improve counselling statistics for our population.

O

7.3 | Outcome predictors of spontaneous and induced labour in fetuses examined up to 34 weeks: a multivariable analysis study

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Objective: To evaluate the best predictors of adverse perinatal outcome (APO) in fetuses examined up to 34 weeks, delivering by spontaneous or induced labor.

Method: This was a retrospective study of 129 single Caucasian pregnancies that underwent an ultrasound examination at 23-34 weeks and entered into spontaneous or induced labor within 30 days. Umbilical artery pulsatility index (UA PI), middle cerebral artery PI (MCA PI), cerebroplacental ratio (CPR) and mean uterine artery pulsatility index (mUtA PI) were converted into multiples of the median (MoM) and estimated fetal weight (EFW) into centiles to adjust for gestational age (GA). APO was defined as a composite of abnormal cardiotocogram, intrapartum pH requiring expedite delivery by cesarean section, 5' Apgar score <7, neonatal pH <7.10 and admission to pediatric care units. Sonographic parameters were evaluated alone and in combination with maternal characteristics (maternal age, pre-pregnancy weight, height, number of gestations, parity, smoking habit and GA at examination) using multivariable logistic regression analysis.

Results: APO was present in 62.8% of the study population. The multivariable model including individual Doppler parameters presented an area under the curve (AUC) of 0.823 (95% CI 0.753-0.893); Detection rates (DR) were of 50.6% and 56.8% for a false positive rate (FPR) of 5% and 10%. Significant predictors of APO were the MCA PI MoM (Odd Ratio (OR) 0.05, 95% CI 0.003-0.698), EFW centile (OR 0.983, 95% CI 0.967-0.998) and GA (OR 0.503, 95% CI 0.29-0.741). When CPR was included instead of UA PI MoM and MCA PI MoM, the model performed nearly identical results.

Conclusions: Up to 34 weeks, prediction of APO after spontaneous or induced labor can be achieved by mean of MCA PI and CPR. The best prediction is achieved combining EFW, GA and cerebral flow.

O

7.4 | Prediction of severe adverse perinatal outcomes in pregnancies complicated by fetal growth restriction

Tracy M. Tomlinson | Laura K. Vricella | Saint Louis University School of Medicine, St. Louis, Missouri, United States

Objective: To evaluate our ability to predict severe adverse perinatal outcomes in pregnancies complicated by fetal growth restriction, at time of diagnosis.

Method: Retrospective analysis of data from 336 singleton non-anomalous gestations (2013-2019) complicated by fetal growth restriction as defined by the Delphi procedure-based consensus. Regression analysis incorporated factors available at time of diagnosis into a model to predict severe adverse perinatal outcomes, defined as perinatal demise, 5-minute Apgar <7, cord pH ≤ 7.1 or base excess ≥ 12. Bootstrapping with 1000 repetitions was used to internally validate the model.

Results: Severe adverse perinatal outcomes complicated 77 (23%) of pregnancies analysed. In addition, 160 (48%) neonates were admitted to the NICU and 112 (33%) were delivered by cesarean for non-reassuring fetal status. All criteria included in the consensus definition was available for analysis with the exception of uterine artery Doppler results. Independent predictors positively correlated with severe adverse perinatal outcomes included gestational age < 30 weeks at diagnosis (aOR 2.80, 95% CI 1.51-5.21) and umbilical artery absent or reversed end diastolic flow (aOR 2.65, 95% CI 1.29-5.46) while negative correlation was detected with maternal height >160 cm (aOR 0.50, 95% CI 0.28-0.90) and isolated abdominal circumference < 3rd centile (aOR 0.20, 95% CI 0.04-0.86). Hypertensive disorders of pregnancy (aOR 1.73, 95% CI 0.93-3.21), chronic hypertension (aOR 1.64, 95% CI 0.80-3.37), and maternal weight ⍰ 68.5 kg (aOR 1.48, 95% CI 0.79-2.76) were not significantly associated with the outcome after adjustment but improved model performance. The bootstrapped area under the receiver operator characteristic curve for the model predicting severe adverse perinatal outcomes was 0.81 (95% CI 0.73-0.84).

Conclusions: Independent predictors positively correlated with severe adverse perinatal outcomes included gestational age < 30 weeks at diagnosis (aOR 2.80, 95% CI 1.51-5.21) and umbilical artery absent or reversed end diastolic flow (aOR 2.65, 95% CI 1.29-5.46) while negative correlation was detected with maternal height >160 cm (aOR 0.50, 95% CI 0.28-0.90) and isolated abdominal circumference < 3rd centile (aOR 0.20, 95% CI 0.04-0.86). Hypertensive disorders of pregnancy (aOR 1.73, 95% CI 0.93-3.21), chronic hypertension (aOR 1.64, 95% CI 0.80-3.37), and maternal weight ⍰ 68.5 kg (aOR 1.48, 95% CI 0.79-2.76) were not significantly associated with the outcome after adjustment but improved model performance. The bootstrapped area under the receiver operator characteristic curve for the model predicting severe adverse perinatal outcomes was 0.81 (95% CI 0.73-0.84).

K

7.5 | Umbilical vein flow predicts adverse perinatal outcome in late fetal growth restriction

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Background: Late onset fetal growth restriction (FGR) is associated with a high risk of perinatal hypoxic events and identification at the time of their diagnosis of those at risk of poorer outcome is challenging.

Objective: Late onset fetal growth restriction (FGR) is associated with a high risk of perinatal hypoxic events and identification at the time of their diagnosis of those at risk of poorer outcome is challenging.

Methods: This was a prospective study of 243 consecutive singleton pregnancies with late FGR. At diagnosis Doppler Pulsatility Index (PI) from uterine arteries, umbilical artery (UA), middle cerebral artery (MCA) the cerebro-placental ratio (CPR) and the umbilical vein flow normalized for fetal abdominal circumference (UVBF/AC) were measured. Adverse perinatal outcome was defined in presence of at least of one of the following complications: emergency cesarean section (CS) for fetal distress, a 5' Apgar score < 7, an umbilical artery ph < 7.10 and neonatal admission to special care unit. The value of the ultrasonographic Doppler parameters to predict risk of abnormal outcome was analyzed.

Results: An adverse perinatal outcome was evidenced in 79 pregnancies (32.5%). In pregnancies with adverse outcome the mean uterine artery PI delta values (p=0.016) resulted significantly higher and the MCA PI (p=0.004), CPR (p=0.002), and UVBF/AC (p≤0.0001) delta values significantly lower when compared to those with normal outcome. Multivariable analysis showed that significant contribution to predict abnormal perinatal outcome were provided by mean uterine artery PI, CPR and UVBF/AC. The area under the curve (AUC) of UVBF/AC delta value resulted significantly higher than those of mean uterine artery (p=0.007) and PCR (p=0.02). The combination of all these 3 variables significantly did not improve the predictive capacity provided by UVBF/AC alone (p=0.333).

Conclusions: Evaluation at the time of diagnosis of UVBF/AC allows in late FGR the identification of fetuses at risk of adverse perinatal outcome with a better accuracy than other Doppler parameters.

K

7.6 | Third trimester ultrasound assessment of cardiac function in the detection and management of FGR

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Objective: Review the findings of detailed analysis size, shape, and contractility of the foetal heart using speckle tracking analysis in fetuses with an EFW<10th centile.

Methods: The study group consisted of 88 fetuses with an estimated foetal weight <10th centile. Twenty-five fetuses had normal Doppler of the umbilical artery pulsatility index (UAPI) and cerebroplacental ratio (CPR) who were classified as small for gestational age. Fetuses with growth restriction were classified as follows: 11 had an isolated abnormal UAPI with forward flow, 11 had an isolated CPR with forward flow of the UA, 3 had an abnormal UAPI and CPR with forward flow of the UA, and 38 had absent or reversed flow of the UA. The four-chamber end-diastolic area and global sphericity index were measured in each fetus. Using speckle tracking analysis of the endocardial borders of the right (RV) and left (LV) ventricles the size and shape were measured using the 24-segment analysis. Evaluation of ventricular global, transverse, and longitudinal contractility were analysed from the end-diastolic and end-systolic location of 24 segments, equidistantly placed from the base to the apex of each ventricle. Each analysis was performed in less than 4 minutes using offline software designed for foetal analysis of the heart. All cardiac measurements were compared to 200 normal fetuses between 20 and 40 weeks of gestation in which the z-scores were computed, and results classified accordingly as normal or abnormal. In addition, logistic regression analysis was performed for the 38 fetuses with absent UAPI to identify which variables predicted foetal death.

Results: Fifty-fetuses with forward flow of the UA demonstrated abnormal size and shape of the 4-chamber view as well as abnormal ventricular contractility, irrespective of the UA Doppler findings. Thirty-eight fetuses with absent or reverse flow of the umbilical artery demonstrated significant changes in the size and shape of the 4-chamber view as well as abnormal global, longitudinal, and transverse contractility. Logistic regression analysis identified cardiac variables that predicted foetal death.

Conclusions: Abnormal size and shape of the 4-chamber view occurs in fetuses with an EFW <10th centile, irrespective the Doppler findings of the UAPI and CPR. Similar findings of abnormal ventricular contractility were present in fetuses with an EFW <10th centile, irrespective of the UAPI and CPR. In addition, cardiac measurements were identified that predicted inutero foetal death in fetuses with an absent or reverse UAPI.

PO

PO 26 | Cardiac dysfunction in fetal growth retardation measured by means of myocardial performance index

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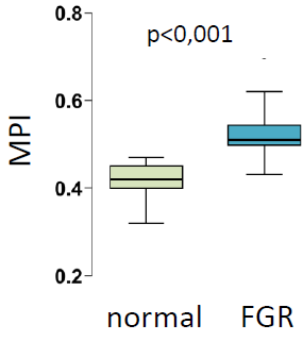
Objective: Fetal growth retardation (FGR) is accompanied by an increased risk for cardiovascular dysfunction, which has been assessed via myocardial performance index (MCI) through in clinical doppler ultrasound examinations.

Methods: : In this prospective case control study the MPI was measure in 23 fetuses with FGR < 3. percentile and compared to 20 apropriate for gestational age (AGA) fetuses between 24-39 weeks of gestation. In addition, the relationship between the cerebroplacental ratio (CPR) and MPI was examined.

Results: The FGR group showed a significantly increased MPI in comparison to the control group (0,42 vs. 0,53, p<0,001). A correlation with a pathological CPR could not be identified.



Conclusions: MPI reveals cardiac dysfunction in FGR decisively before measurable fetal doppler pathologies are detectable.

Session 8: Prevention and treatment

O 8.1 | Do we need treatment for severe early onset intrauterine growth restriction: Update on EVERREST Project

Kasia Maksym | Anna L David on behalf of the EVERREST Consortium |
Elizabeth Gareth-Anderson Institute for Women's Health, University College London, UK

Objective: To evaluate perinatal and maternal outcomes in cohort of patients with the most severe early onset intrauterine growth restriction (IUGR).

Methods: To date we recruited 130 patients into EVERREST prospective study on early onset IUGR. We analysed sub-cohort of 43 patients fulfilling criteria of proposed treatment trial: gestation between 20 and 26 weeks, estimated fetal weight (EFW <3rd centile, uterine artery (UtA) pulsatility index (PI) >1.2 and raised umbilical artery (UA) PI of more than 3 SD above the mean.

Results: 30 patients were eligible for proposed trial at enrolment and 13 become eligible during follow up. Median gestational age when eligibility criteria were met was 23+4 (20+4 – 26+0) weeks and median estimated fetal weight 352 (135-490) g. Median UA PI measured 2.41 (1.80-978) and median UtA PI 1.92 (1.20-3.25). Median length of follow up was 19 (2-49) days giving median delivery gestation 26+6 (23+0-31+0) weeks. Delivery was expedited in 30 (70%) cases. In most cases indications were due to deteriorating fetal condition and 6 patients developed severe preeclampsia which deemed delivery necessary. We noted 26 (60%) stillbirths (24 intrauterine deaths and 2 terminations) and further 3 neonatal deaths – 67% perinatal loss.

Conclusions: Early onset severe IUGR carries very high risk of preterm delivery and perinatal lose. Treatment is urgently needed, and we hope that our trial of intra-uterine artery administration of Ad.VEGF-$D^{\Delta N \Delta C}$ will safely improve outcomes.

O 8.2 | Classifying adverse events in early onset fetal growth restriction to develop a clinical trial dose-escalation plan

Anna L David | Kasia Maksym | Rebecca Spencer | Hakim-Moulay Debhi | Kate Maclagan | Helen Knowles | Neil Marlow | Jade Okell on behalf of the EVERREST Consortium | Elizabeth Gareth-Anderson Institute for Women's Health, University College London, UK | University College London Comprehensive Clinical Trials Unit, London UK

Objective: Developing novel therapies for early onset fetal growth restriction (FGR) requires a thorough knowledge of the natural history of the disease to quantify Adverse Events (AEs) in patients undergoing the trial intervention, compared to control patients. In a phase I/II clinical trial, the primary objective is safety, defined as the occurrence of Dose-Limiting Toxicity (DLT) events in the mother, fetus and neonate. Dose escalation depends on a-priori estimates of Dose Limiting Toxicity (DLT) risk. We quantified the rate of grade 3, 4 and 5 AEs in women with early onset FGR to define baseline DLT risk.

Methods: We used a cohort of 43 patients fulfilling the criteria of the proposed clinical trial from UCLH Fetal Medicine Unit: gestation between 20 and 26+6 weeks, estimated fetal weight (EFW) <3rd centile and <500g, uterine artery (UtA) pulsatility index (PI) >1.2 and raised umbilical artery (UA) PI of more than 3 SD above the mean. We assessed AEs as defined in MedDRA, the Medical Dictionary of Regulatory Affairs (maternal and fetal) developed by the EVERREST consortium in 2016 and from National Cancer Institute INC Neonatal Adverse Events Terminology.

Results: Grade 3 maternal AEs were haemorrhage (5%), pre-eclampsia (14%), puerperal infection (2%) and retained placenta (7%). There were maternal grade 3 or 4 AEs of primary postpartum haemorrhage, anaemia, eclampsia, chorioamnionitis, amniotic fluid embolism. Grade 3 and 4 fetal AEs (cardiac, fluid, bradycardia, abnormal brain and gastrointestinal imaging and preterm premature rupture of the membranes) were observed in 2-9% of cases. There were no grade 3 or 4 AEs of fetal tachyarrhythmia, fetal movement disorders, abnormal fetal musculoskeletal or renal imaging, chorioamnionitis, fetal anaemia or new onset fetal structural abnormalities detected. Neonatal AEs were common: chronic lung disease Grade 3 (17%) and Grade 4 (50%), Necrotizing Enterocolitis Grade 4 (8%) and Sepsis (25%).

Conclusions: Grade 3 and 4 AEs are common in pregnancies affected by early onset FGR. This must be considered when planning dose escalation trials of novel therapeutics. Defining DLT to include Grade 3 AEs gave an excessively high rate of baseline toxicity in our population, hence we plan to use maternal, fetal or neonatal DLT defined as Grade 4 or 5 AEs only.

O

8.3 | The relation between perinatal outcome and the diagnostic criteria of late fetal growth restriction

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Objective: Since the DELPHI criteria to diagnose late fetal growth restriction have been proposed we aim to relate these criteria to perinatal outcome in our own retrospective cohort of fetuses born SGA (<10th perc.) We hypothesize that abnormal Doppler findings lead to an increased relative risk when compared to lowest biometry categories. In addition, we test whether the umbilico-cerebral-ratio (UCR) performs better in predicting outcome in comparison to CPR.

Methods: From a cohort of SGA (n=1079) born between 2006-2014 EFW, AC, PIUA, CPR and UCR from the last assessment prior to delivery were included into the retrospective analysis. The collective was dichotomized according to the percentiles given by the DELPHI criteria and related to combined end-points of peri- and neonatal outcome.

Results: An adverse perinatal outcome occurred in 129 cases (40x APGAR≤7/pH≤7,1/BE≤-10; 48x measures for resuscitation, 86x transfer to NICU; 3x mortality<56d). OR for EFW<2.5th perc. and CPR<1 wielded an approximately identical effect (OR 2-3). If Doppler was normal an AC>/<10th perc. did not make a difference. In the case of an EFW<2.5th perc. PIUA>95th perc. and CPR<1 lead to an OR of 2-3, in cases of AU<10th perc. PIUA>95th perc. doubled the risk (OR 2-3 vs. 1-2) the same applied to an EFW<2.5th perc. in the case of CPR<1 (compound outcome OR 3.4 vs. 1.9). The discriminative performances of CPR and UCR remained identical.

Conclusions: The risk increasing effect of the studied parameters can be charted as follows: [AC<10]<[EFW<2,5]=[CPR<1]<[PIUA>95]. The results are bound to be influenced by the retrospective design of the study. The likelihood of a trial of labor was reduced in cases of abnormal umbilical Doppler values. We did not find an advantage to use UCR instead of CPR to assess our cohort of SGA fetuses of more than 32 wks GA.

PO

PO 27 | Pentaerithrityl tetranitrate (PETN) for secondary prevention of fetal growth restriction (PETN-Trial)

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Objective: Affecting approximately 10% of pregnancies, fetal growth restriction (FGR), is the most important cause of perinatal mortality and morbidity. Impaired placental function is the leading cause of FGR. Screening for placental insufficiency based on uterine artery Doppler measurement is well established. However, there is no treatment option for pregnancies threatened by FGR. The organic nitrate pentaerithrityl tetranitrate (PETN) is widely used for the treatment of cardiovascular disease and has been shown to possess potent protecting effects at the endothelium by enhancing the expression of the antioxidant genes. In a randomized placebo controlled pilot study our group could demonstrate a risk reduction of 39% (relative risk RR=0.609, (95%CI:0.367-1.011) for the development of FGR and FGR or death (RR=0.615, CI:95%0.378-1.000) by delivering PETN to patients with impaired uterine artery Doppler at mid gestation. (Schleussner,2014) To confirm these results a prospective randomized placebo controlled double-blinded multicentre trial was initiated.

Method: Inclusion criteria are uterine artery Doppler resulting in mean PI >1.6, at 190 to 226 weeks of gestation in singleton pregnancies. Included patients will be monitored at a 4weeks schedule. Dopplerparameters, maternal und fetal clinical outcome will be assessed. Primary outcome measures are the development of FGR (defined by birth weight <10thcentile and uterine artery mean PI of >1.6) and severe FGR (birth weight below the 3rdcentile) and perinatal death, preterm delivery and the rate of neonatal intensive care unit admission are secondary endpoints. Power calculation was based on the results of the pilot study, revealing a number of 324 patients to be enrolled.

Results: Patient enrolment was started in August 2017. Up to date 262 (80%) have been successfully enrolled. Results are expected in 2020.

Conclusions: If the results of the pilot study will be confirmed obstetricians worldwide would finally be able to offer patients at risk a therapeutic intervention.

O

8.4 | Maternal vascular malformation in the placenta is an indicator for fetal growth restriction irrespective of neonatal birthweight

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Objective: To study the association between placental pathology and neonatal birthweight and outcomes, and whether a combination of first trimester biomarkers and fetal growth velocity can predict placental lesions.

Methods: The presence of maternal vascular malperfusion (MVM) lesions (Amsterdam criteria) was recorded in a retrospective cohort of 1100 singleton pregnancies in the Maastricht University Medical Centre, 2011-2018. First trimester maternal characteristics and PAPP-A, PlGF and sFlt-1 levels were collected. Fetal growth velocities were calculated (mm/week) from 20 and 32 weeks for abdominal circumference, biparietal diameter, head circumference and femur length. Data were compared between neonates with 'small for gestational age' (SGA <p10) and different categories of 'appropriate for gestational age (AGA)': AGAp10-30, AGAp30-50 and AGA>p50 (reference), using one-way ANOVA and post hoc test.

Results: There were significantly more MVM lesions in the SGA group (94.6% p<.0001), but also in the AGAp10-30 (67.3% p<.0001) and AGAp30-50 (41.6% p=0.002), compared to the reference AGA group (19.3%). The prediction of MVM for a 20% false-positive rate, with maternal characteristics, predicted 25.2% of placental lesions. The addition of birthweight percentile gave a prediction of 51.7% for MVM. However adding placental biomarkers and fetal growth velocities (instead of birthweight percentile) to the maternal characteristics, gave a prediction of 81.8% (PPV 49.5%, NPV 53.7%).

Conclusions: Placental MVM lesions correlated inversely with birthweight even in AGA neonates, and was associated with slower fetal growth and more adverse outcome in SGA neonates. A combination of first trimester biomarkers and fetal growth velocity had good prediction of placental MVM lesions, as an indicator of fetal growth restriction irrespective of neonatal weight.

O

8.5 | Impact of human embryonic morphological development on fetal growth parameters: the Rotterdam periconceptional cohort (PREDICT study)

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Department of Obstetrics and Gynaecology, Erasmus MC, University Medical Centre, Rotterdam, The Netherlands | Department of Obstetrics and Gynaecology, Hospital V. Buzzi, Università degli Studi di Milano, Milan, Italy

Objective: According to the Carnegie classification, embryonic morphological development can be divided into 23 stages. Despite the normal sequence of developmental events is constant in every embryo, different times and velocities can occur, and a delayed morphological development has been associated with deranged periconceptional maternal dietary patterns and one-carbon biomarkers. In order to clarifying the meaning of developmental delays among non-malformed embryos, we aim to investigate associations between embryonic morphological development and subsequent fetal growth.

Methods: 182 singleton viable non-malformed pregnancies were enrolled in a prospective cohort study. Serial transvaginal three-dimensional ultrasound (3D US) scans were performed between 6+0 and 10+2 gestational weeks and embryonic developmental trajectories were assessed in a virtual reality system by using internal and external morphological criteria of the Carnegie classification. Fetal growth ultrasound parameters were retrieved from medical records and Z-scores were calculated for mid-pregnancy estimated fetal weight (EFW) and birth weight (BW). Associations between longitudinal first trimester Carnegie stages and fetal growth parameters were investigated by using linear mixed models adjusted for parity, alcohol and multivitamin supplement use, smoking, BMI, age, geographical origin and conception mode.

Results: 576 first trimester 3D US scans were performed (median of three scans per pregnancy). Embryonic development was positively associated with EFW (β=0.69 (95%CI: 0.51; 0.86), p<0.001). Positive associations were confirmed between embryonic development and BW in males (β=0.37 (95%CI: 0.04; 0.70), p<0.05), meaning an increase by 165 grams in BW for every unit increase in Carnegie stage. In females, embryonic development was negatively associated with BW (β= -0.36 (95%CI: -0.62; -0.10), p≤0.01).

Conclusions: Human embryonic morphological development is associated with subsequent fetal growth among non-malformed pregnancies with gender-specificity at term. We suggest that first trimester embryonic morphological assessment combined with sex-specific strategies could better define normal development and predict fetal growth in later pregnancy.

O

8.6 | Identification of phenotypes of FGR using a network-based clustering approach

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Objective: Current classifications of FGR in early vs late, or SGA vs. FGR are based on clinical features, but there is limited information of the pathohysiological basis for such definitions. We sought to describe phenotypes of FGR using machine-learning unsupervised network-based analysis.

Methods: A clinical dataset comprising 573 pregnancies with FGR (BW<10th centile) in which clinical characteristics, fetal biometry, fetoplacental Doppler, and H1-NMR metabolomics in maternal and cord blood were prospectively collected. Data on maternal and fetal metabolomics, gestational age at diagnosis were used to construct individual patient networks, these networks were then combined to generate a single fused network using similarity network fusion (SNF) method. Spectral clustering was then performed on this fused network to reveal clusters.

Results: SNF-analysis generated three clusters. Cluster 1 (10.3%) had a mean GA at diagnosis (Dx) of 27.9 wks, significant differences in fetoplacental Dopplers, significantly higher concentrations of maternal s-Flt-1/PlGF ratio, lower cord-blood glucose and higher circulating lipids, rates of adverse perinatal outcome and stillbirth of of 66 and 22%. Cluster 2 (28.8%) had a mean GA at Dx of 32.3 wks, and similar but milder features as Cluster 1, with APO of 38% and stillbirth of 0.6%. Cluster 3 (61%) had a mean GA at Dx of 35.1 wks, and normal values in Doppler and angiogenic values, with APO of 12% and mortality of 0.3%.

Conclusions: Unsupervised machine-learning models generated three phenotypes that resemble early-, late FGR and late SGA. The results provide novel insights into the molecular basis and clinical heterogeneity of FGR and support the use of machine-learning models to advance in the understanding of the multiphenotypic nature of FGR.

Session 9: Management guidelines: putting evidence into practice

K

9.1 | International review of fetal growth guidelines

Lesley McCowan | University of Auckland, New Zealand

Objective: SGA babies (birthweight <10th centile) make up 28-45% of non-anomalous stillbirths, and many are not recognized as SGA before birth. Improved identification, careful surveillance and timely birth is associated with reduced SGA stillbirths. The objective of this presentation is to provide an overview of international fetal growth guidelines

Methods: A search of Medline, Google and the International Guideline Library identified seven National Guidelines on management of pregnancies with FGR/SGA published from 2010 onwards. This overview will summarize consensus and controversy; highlight recent evidence that could be incorporated into existing guidelines; and recommend research priorities.

Results: There is general consensus (≥5/7 in agreement) on early pregnancy risk selection and use of low dose aspirin for women with major risk factors for placental insufficiency. All guidelines highlight the importance of smoking cessation and recommend fundal height measurement in the third trimester, three recommend customized growth charts, two McDonald's rule and two don't specify. Routine third trimester scanning is not recommended (6/7). Umbilical artery Doppler studies are recommended in SGA/FGR pregnancies (7/7) and 2-4weekly scans are recommended after SGA/FGR diagnosis.

In late onset FGR (≥32 weeks) 5/7 recommend cerebral Doppler studies but recommended timing of delivery varies. All recommend corticosteroids before birth at <34 weeks, and 5/7 recommend magnesium sulphate in early FGR. 6/7 recommend CTG to time delivery in FGR <32 weeks. Delivery timing with AREDV varies from 32 to ≥34 and 30 to ≥34 weeks respectively.

Conclusions: Where evidence from RCTs and meta-analyses exists, there is generally consistency between SGA guidelines. Research priorities include impact of routine late third trimester scanning on morbidity and mortality, optimum delivery timing in late onset FGR and which ultrasound standards should be used.

PO 10 | Impact of customised growth charts in a tertiary hospital – local data for shared decision making

Lucy Armatage | Annie Burrin | Amy Robb | University Hospital of Wales, Cardiff, UK

Objective: To determine the outcomes of induction of labour (IOL) for an ultrasound (USS) indication over 6 months in a tertiary hospital delivering approximately. 5,600 women a year.

Methods: Electronically retrieved data for all IOL between 1st Feb and 31st July 2018 inclusive (6 months), where the indication was based on fetal growth. The estimated fetal weight at the last USS was recorded and compared to the birthweight. Customised birthweight centiles were known as they are routinely recorded at delivery. Scan accuracy was calculated to correct for the time interval between USS and delivery.

Results: 190 women had IOL for the indications suspected big (>90th customised centile (cc)), tailing growth and suspected small (<10th cc). 7 cases were excluded. Scan accuracy; for suspected macrosomia, 83% of birthweights were within the accepted 15% scan error. For suspected small babies, 90% of those birthweights were within the accepted scan error and for the remaining 10% (9 women) with scans with an error >15% in all but one case the babies were smaller than the scans predicted. Suspected big, 59 women. Only 24% of these babies were >90th customised centile at birth. The majority, 85% of these women were delivered >39 weeks gestation and the spontaneous vaginal delivery rate was 48%. Suspected small, 85 women (EFW <10th centile) of these women who were induced, 64% of them delivered a baby less than the 10th centile for birthweight, overall 79% were less than the 20th centile. The majority (71%) were delivered <39 weeks gestation and overall Spontaneous vaginal birth was 74%.

Conclusions: Women must be appropriately counselled about the accepted and inherent error of USS EFW, especially in the context of suspected macrosomia. Knowledge of local data and in particular outcomes is essential to enable shared decision-making between women and their Obstetrician or midwife.

PO 11 | Audit of missed small for gestational age babies – does implementation of GAP training make a difference?

Anagha Chidrawar | Priti Wuppalapati | Natalie Hayes | Neeraja Singh | Bolton NHS Foundation Trust, UK

Objective: The aim of this audit was to identify the reasons behind undetected SGA babies, determine whether local and national policies were being followed and by looking at the outcomes, recognise any areas of potential improvements to future care.

Methods: We did a retrospective audit of 50 cases over six month period. Included in the audit were babies who were born.

Background: NHS England has published guidance that aims to reduce stillbirths in England; the 'Saving Babies' Lives Care Bundle'. The bundle includes an element on risk assessment and surveillance for foetal growth restriction. Foetal growth restriction is associated with increased perinatal mortality and morbidity. Customised Growth Charts(CGC)are known to improve detection of small for age and growth restricted babies. CGC were implemented in our trust in September 2012. Customised assessment of birthweight and foetal growth has been recommended by the RCOG since 2002 and their use has been re-emphasised in the 2013 revision of the Green Top Guidelines. However we realised they were not being used properly due to lack of training and knowledge. Hence the aim to introduce online GAP training to begin with followed by face to face individual training was rolled out in 2015. To support the work towards improving awareness and enhancing training of staff in Growth Assessment Protocol(GAP), a SaBINE (Saving Babies in North England) midwife was designated. Annual audits over past three years from 2016 to 2018 were undertaken to review missed SGA cases in the antenatal period.All stillbirths were also assessed by GAP formula to see if they were missed SGA in antenatal period.

Results: Audits in our trust have shown that antenatal detection of foetal growth restriction is directly related to the degree of training and implementation of standardised protocols.Recently the antenatal detection rate of SGA babies was 51% which was above average GAP user.Our annual stillbirth audit shows that stillbirths related to missed SGA is coming down gradually.

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PO

12 | Fetal growth diagnosis and management among obstetric and neonatal medical professionals – preliminary results of a survey of practice

Anna Kajdy | Jan Modzelewski | K Muzyka-Placzyńska | D Filipecka-Tyczka | D Sys | K Herman | B Mazur | M Rabijewski | Department of Reproductive Health, Centre of Postgraduate Medical Education, Warsaw, Poland | Saint Sophia's Hospital, "Żelazna" Medical Centre, Warsaw, Poland | Institute of Sociology and Philosophy, Polish Academy of Sciences, Warsaw, Poland

Objective: Fetal growth its diagnosis and management are the leading challenge of perinatal medicine. Poland does not have published national guidelines on growth management. The aim of this paper was to assess the knowledge of healthcare professionals in the field of perinatal medicine regarding fetal growth diagnosis and management.

Methods: A questionnaire was created based on similar studies performed in other European countries. It consisted of a set of questions regarding demographic data, methods of growth assessment and management. It was a mixed hand out and internet-based survey.

Results: 121 medical professionals have participated in the questionnaire. 86,78% of respondents agreed that pregnancy age should be modified based on first trimester ultrasound. 89,26 % agreed that III trimester ultrasound has a +/- 15 % margin of error. When asked which growth charts are best fit for assessing growth in a given population 14,05% marked standard; 42,15% reference, 23,14 % customised and 20,66% did not know the difference between the three choices. 63,64% stated that they use some kind of growth chart to assess growth and qualify fetuses for monitoring. 70,65% used the 10th centile as a cut off, 19,57% 5th centile and 7,61% 3rd centile. Only 38,02 % would diagnose FGR based on fetal weight only. 26,09 % using the 10th centile cut off, 10,87% 5th centile and 60,87 % 3rd centile. Less than half of the respondents were able to name the growth chart or tool that they use for assessment. The most common responses were Yudkin, Haddlock and online calculators of Fetal Medicina Barcelona and Fetal Medicine Foundation.

Conclusion: A lot of confusion is observed primarily in the aspect of cut off values for identification, subsequent monitoring and management. There is need for extensive training and education in this field. There is need for uniform national recommendations.

PO

13 | Effect of implementation of GAP in Cardiff, Wales

Annie Burrin | Amy Robb | Nerys Thomas | Ceri Phillips | Rhiannon Lewis | Cardiff & Vale University Health Board, UK

Objective: To reduce stillbirth by antenatal detection of fetal growth restriction. Implementation of the Growth Assessment Protocol of the Perinatal Institute by utilisation of existing resources to their maximum potential.

Methods: A small team worked together to draft a local guideline based on the Growth Assessment Protocol which had been mandated by Government for use in all Welsh Maternity Services. While ultrasound resources were finite, amendments were made to the frequency of interventions during pregnancy, but protected the third trimester to ensure that late onset growth restriction could still be detected.

Results: 74% reduction in stillbirth after 18 months.

Conclusion: A staged approach to implementation of GAP protocol is achievable in all maternity services. Avoidable stillbirths can be significantly reduced by the implementation of the Growth Assessment Protocol. Continual audit is essential to provide data which can be used for learning and improvement. Providing a continual programme of teaching to all staff within maternity services is essential. Making small changes incrementally is efficacious. This project is an excellent example of Prudent Healthcare in practice.

P O

14 | Audit for detection of small-for-gestational-age babies at Royal Free Hospital using Growth Assessment Protocol

Badenan Fathulla | Shailja Verma | Royal Free Hospital, UK

Objective: Is detection rate of small-for-gestation-age babies at our hospital meeting 50-55% standards?

Methods: 1,308 pregnancies in tertiary referral hospital and 515 were nulliparous. Two researchers independently screened cases, extracted patient characteristics, and data. The index test was the Growth Assessment Protocol and reference standard was detection rates of small-for-gestational-age at birth in top ten trusts across UK. Missed cases audit done.

Results: Approximately a tenth of women delivered small-for-gestation age babies (48/423; 11%). Growth Assessment Protocol was fulfilled in 16 women and were suspected to deliver a small-for-gestational-age baby. Of these 16 women, 12 women (75%) were diagnosed with small-for-gestation age antenatally. Our detection rates are 32 %, missing on predominately low risk group.

Conclusion: Growth Assessment Protocol is an effective tool in ruling out small-for-gestational-age babies. Growth Assessment Protocol performs well as a rule-out test facilitating expedited diagnosis and ensuring low-risk women can remain in routine antenatal care. But to have good detection rates, strict adherence to the protocol is required. Improvement can be made at various levels and dedicated unit with team partnership required for the success of Growth Assessment Protocol. Whether offering third trimester ultrasound scan routinely to all low risk pregnant women is a better solution is still the topic of debate?

P O

15 | Obstetric risk factors for stillbirths in University of Nigeria Teaching Hospital (UNTH), Enugu

Eziamaka Ezenkwele[1,2] | UU Aniebue[1] | [1]Department of Obstetrics and Gynaecology, University of Nigeria, Enugu | [2]Department of Global Health and Population, Harvard School of Public Health, Boston, Massachusetts, USA

Objective: To determine the stillbirth rate and obstetric risk factors for stillbirth in University of Nigeria Teaching Hospital.

Methods: Retrospective observational descriptive study of 132 cases of stillbirths from 128 mothers in UNTH, Enugu from September 2001 to July 2006 was carried out.

Results: The stillbirth rate was 38 per 1000 total births. The maternal age for singleton stillbirths ranged from 20 to 45 years with a mean of 31.1± 5.5 years. That of twin pregnancy ranged from 26 to 37 years with a mean of 30.5 ± 4.6 years. The grand-multiparous and unbooked mothers were more likely to have stillbirth with a P value of 0.0003 and less than 0.05 respectively. In singleton stillbirths there was no known obstetric risk factor in 26.4% of the cases. The commonest obstetric risk factors in singleton stillbirths were prematurity (n=29), birth trauma and stress asphyxia (n=28) and pregnancy induced hypertension, pre-eclampsia and eclampsia (n=20). The commonest obstetric risk factors in twin stillbirths were birth trauma and stress asphyxia (n=3), and placental dysfunction and prematurity (n=2 for each).

Conclusion: The stillbirth rate is among the highest in the world. The most vulnerable women for stillbirth were grand-multiparous and unbooked mothers. The commonest obstetric risk factors were prematurity, intra-partum related factors and pregnancy induced hypertensive disorders. Recommendations include prenatal fetal surveillance to identify the at-risk fetus for stillbirth in order to intervene before the event occurs and provision of intra-partum obstetric best practices in a timely fashion to prevent intra-partum demise. Future research would be to evaluate any change in trend over the years in the stillbirth rate in this institution and the factors leading to the change to help drive institutional health management policy.

P O

16 | Treasure hunting: the midwife-led fetal growth assessment (MFGA) clinic to identify the high risk fetus in the low-risk pregnancy

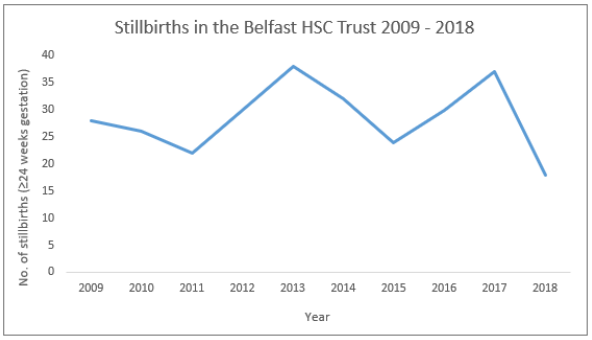
Heather Watson | Brenda Kelly | Helen Rice | Christina Menage | Mary McCormack | Colette Gordon | Sally Hamilton | Belfast Health and Social Care Trust, Northern Ireland, UK

Objective: The aim of the clinic was to improve access to third trimester scanning for surveillance of fetal growth, and detection and management of suspected FGR/SGA) in the low-risk population of women.

Methods: Arranging a 3rd trimester USS was a challenge for midwives, as antenatal clinics were often at full capacity. The MFGA clinic was set up in February 2017 to provide a direct route to arrange an USS, where there was a suspicion of FGR/SGA following a FHM.

Results: Over 2 years, of the 816 USS that were performed, 105 (13%) were referred into consultant-led care with suspected FGR/SGA, with 30% of these babies born (n=32) having a birthweight <10th centile. Of these 32 babies with a birthweight <10th centile, 63% had a birthweight <5th centile (n=20). Over 2 years, of the 816 USS that were performed, 105 (13%) were referred into consultant-led care with suspected FGR/SGA, with 30% of these babies born (n=32) having a birthweight <10th centile. Of these 32 babies with a birthweight <10th centile, 63% had a birthweight <5th centile (n=20).

Conclusion: This clinic assists in the detection of FGR/SGA babies, and also reassure those who did not require any further intervention to remain on a low-risk MLC pathway. Continuing work is required to further analyse the link, if any, that may exist between the reduction in the stillbirth rate and the improved access to third trimester scans for MLC women. Establishing the MFGA clinic has led to increased satisfaction rates for mothers, but more importantly increased detection rates of FGR/SGA in this low risk population of women following an MLC pathway.



P O

17 | The knowledge and experiences of pregnant women regarding physical activity during pregnancy

Katarzyna Kosińska – Kaczyńska | Izabela Walasik | Katarzyna Kwiatkowska |
First Department of Obstetrics and Gynaecology, Medical University of Warsaw, Poland

Objective: The aim of the study was to to analyze the knowledge and experience of women regarding physical activity during their latest pregnancy.

Methods: An anonymous questionnaire, consisting of 57 questions, was completed electronically in 2018 by women who gave birth at least once. The respondents were qualified as "physically active during pregnancy" if they performed physical exercises such as regular walks, marching, jogging, working out at at a gym, swimming, yoga, pilates, fitness, exercise-ball workouts or home gymnastics.

Results: The study group consisted of 9345 women. 52% of them performed exercises during pregnancy. The main reasons for a lack of physical activity were: lack of interest in physical activity (45%), lack of energy (40%), lack of knowledge regarding proper exercise during pregnancy (34%). Non-active respondents suffered from gestational hypertension (6,7% vs 9,2%; p<00,1) and gave birth prematurely (11% vs 15%; p<001) to newborns with a lower birth weight significantly more often (<2500g vs >2500g; p<0,001). Physically active women reported suffering from pregnancy-related ailments such as fatigue or back pain significantly less often. Physically active women had vaginal delivery more often (61% vs 55%; p<0,05). 13% of women felt discriminated due to their physical activity during a pregnancy. 22% of respondents' physical activity was not accepted by their environment. 39,1% of the women were told by others to stop physical exercise because it was bad for the baby's health.

Conclusion: The knowledge of Polish women regarding physical activity during pregnancy is insufficient, which may influence a lack of will to initiate such activity among pregnant women. Physical activity of a pregnant woman may have an impact on the course of the pregnancy and birth.

PO

18 | Detection of small for gestational age fetuses in a district general hospital

Jothilakshmi Nallathambi | Maria Johnson | Dexter Pascall | East Sussex Health Care NHS Trust, UK

Objective: To determine the incidence of small for gestation age babies and to determine the antenatal detection rate of small-for-gestational-age (SGA) babies.

Design: A retrospective review was performed for women 37 weeks of gestation and above, who had singleton babies weighing below 10th centile between April 2017-March 2018.

Methods: The data was collected for all babies born after 37 weeks with birth weights below the 10th centile, using the Hadlock foetal growth curve (population-based chart). The ultrasound scans performed after 28 weeks were reviewed.

Results: The average SGA rate in our trust was 9%(n=256), and is comparable to the national SGA rate of 10%. Our overall antenatal detection rate of SGA for singleton pregnancies 37 weeks and above was 28% (n=72). This is better than the national SGA detection rate of 18% in trusts that use population-based growth charts. The detection rate at each gestation week was 37 weeks - 62%, 38 weeks - 39%, 39 weeks - 27% and 40 weeks - 18%. Women who smoked had an SGA rate of 21% (2.3 times the Trusts 9% SGA rate). There was an increased SGA rate in women with BMI >40 and BMI <18, although a decreased rate in women aged <18. There were no stillbirths or early neonatal deaths attributable to SGA during the study time period.

Conclusion: The local detection rate of SGA is higher than similar trusts but less than trusts using customised charts. The detection rate decreases significantly as gestational week advances. Therefore, we plan on implementing serial scans at later gestation for high risk women and/or adopting a form of customised reference charts.

PO

19 | Antenatal corticosteroid administration prior to elective caesarean section in diabetic women between 37 to 38+6 weeks gestation - more harm than good?

Priti Wuppalapati | Anagha Chidrawar | Neeraja Singh | Bolton NHS Foundation Trust, UK

Objective: The purpose of this audit is to look at the neonatal outcome particularly at transient tachypnoea of new-born or neonatal respiratory distress requiring admission to neonatal unit in pregnant women with diabetes delivered by elective caesarean section between 37 – 38+6. weeks gestation.

Methods: We conducted a retrospective study of 50 pregnant women with diabetes undergoing elective LSCS between 37and 38+6 weeks gestation. Data was identified using hospitals electronic medical records. The neonatal outcome in terms of APGAR scores, need for admission to Neonatal unit due to respiratory distress or transient tachypnoea were collected. Currently there is no national guidance available regarding use of steroids for foetal lung maturation in pregnant women with diabetes undergoing elective caesarean section. Our current practice is to give steroids for foetal lung maturation only if <37 weeks. We do not give steroids if caesarean is planned at 37 weeks.

Discussion: There is a relation between maternal diabetes and respiratory distress syndrome of the new-born. Perinatal data suggests that an infant born to diabetic mother has 23.7 times greater risk of respiratory distress syndrome compared to infants born to non -diabetic mothers. NICE recommends to offer IOL/Elective C/S for type 1/2 diabetic mothers between 37-38+6 weeks gestation. The RCOG recommends that antenatal steroids should be given for all Elective LSCS <38+6 to reduce respiratory morbidity in new-borns. Diabetes should not be considered a contraindication to antenatal steroids for foetal lung maturity. Saccone and Berghella in a systematic review of antenatal steroids for near term fetuses in diabetic women noted that more research was needed in view of increased need for insulin doses in achieving glycemic control and need for close monitoring after steroid administration.

Conclusion: As our audit is ongoing we will soon be able to get the prevalence of neonatal respiratory distress in this subgroup of patients and this may help to make recommendations to change our guidelines and practice.

PO

20 | Placenta clinic approach to screening for placental insufficiency

Saudabi Valappil | Rasha Al Zaabi | Leanne Bricker | Fetal Medicine Department, Corniche Hospital, Abu Dhabi, UAE

Objective: Placenta clinic is a unique multidisciplinary service that offers comprehensive expert care to women at risk of placental insufficiency. We share our experience of successfully setting up a placenta clinic with evidence based pathways in the tertiary maternity unit in Abu Dhabi, UAE & the challenges we faced. We also outline the results from the prospective analysis of our patient data.

Methods: The placenta clinic was set up in November 2018 to enable prevention and early detection of FGR in women at high risk of placental insufficiency. Risk assessment is done at booking and women are seen in the clinic from 12-16 weeks onwards. All women are commenced on Aspirin 150mg daily. Women with mean uterine artery Doppler PI >95th centile at 22-24weeks are seen at regular intervals until delivery. If SGA or FGR develops, they are transferred to the Fetal Medicine clinic where all small babies are managed. Women with normal uterine artery Doppler are advised 4 weekly growth scans in the US department and seen again at 34 weeks to assess the risk of late onset IUGR.

Results: From 1/11/18 to 31/05/19 we screened 85 women for placental insufficiency from 12 weeks of gestation. Of these 38 women delivered, 39 are ongoing pregnancies and 9 were lost for FU. Within this cohort, 29% had abnormal uterine artery Doppler & we found a good correlation between the Doppler in 1st trimester, 22-24 weeks and in 3rd trimester. 11/38 (29%) babies were SGA,12/38 (31%)FGR and one case of still birth in very early onset FGR & Pre-eclampsia. Overall maternal outcome was good except for 3 cases of Pre-eclampsia. Sensitivity of abnormal uterine artery Doppler was 53% & specificity 73% for predicting small babies. However, prediction of late onset SGA was poor with this screening tool.

Conclusion: From our experience, screening for placental insufficiency through a dedicated placenta clinic offers effective prediction of small babies enabling early detection & management to optimise the outcome. Lack of perinatal pathology service & opportunity for high quality research are the challenges we face to be addressed in the near future.

PO

21 | The intrapartum impact of failure to identify the small for gestational age (SGA) fetus prior to the induction of labour

Sian Bullough | C Shields | Andrew Sharp |
University of Liverpool | Liverpool Women's Hospital | Members of Liverpool Health Partners

Objective: A recent review of UK practice into the management of SGA babies highlighted variations across the country including high induction rates. What is even less well understood are the intrapartum impacts of SGA, to both mother and baby and how awareness of a diagnosis of SGA impacts this. We reviewed outcomes from women with an antenatal diagnosis of SGA and those in whom the baby was only found to be SGA after birth.

Methods: We retrospectively reviewed outcomes for women having induction of labour for an indication of SGA with a confirmed birthweight <10th centile (known SGA) and women with induction for other reasons but who also confirmed birthweight <10th centile (unknown SGA) between April 2016 to April 2018. Data was collated from routinely collected data.

Results: There were 203 women with known SGA babies and 441 women who had a baby identified as SGA post delivery. There were significantly more emergency caesarean sections if the fetus had unknown SGA but no significance difference between the proportion of these that were urgent/Category 1, RR = 0.79 (CI: 0.41 – 1.51, p = 0.47). Fewer women opted for an epidural if they were known to have an SGA baby. SGA babies that had been identified antenatally were significantly more likely to be <3rd centile on customised GROW charts. There was no difference in other important outcomes, rates of admission to NICU and low cord gases (pH<7.2 and pH<7.0).

	Known SGA *(n=203)*	**Unknown SGA** *(n=441)*	**Relative Risk**	**95% CI**	**P Value**
Caesarean Section	29 (14.3%)	94 (21.3%)	1.49	1.02 – 2.19	**0.04**
Epidurals	32 (15.8%)	108 (24.5%)	1.55	1.09 – 2.22	**0.02**
<3rd Centile	145 (71.4%)	179 (40.6%)	0.57	0.49 – 0.66	**<0.0001**
NICU Admission	23 (11.3%)	71 (16.1%)	1.42	0.92 – 2.21	0.12
	(n=154)	*(n=305)*			
pH<7.2	31 (20.1%)	88 (28.9%)	1.43	0.99 – 2.06	0.05
pH<7.0	4 (2.6%)	5 (1.6%)	0.63	0.17 – 2.32	0.49

Conclusion: In women with an unknown SGA baby the rate of caesarean section was 21.3% compared to 14.3% if known SGA, and a UK national average of 16%. It is unclear what the mechanism is that leads to less caesareans in known SGA but may reflect altered management of labour, which may lead to greater prediction and earlier interventions during labour. There needs to be a greater awareness of the impact, or lack of, of a diagnosis of SGA on maternal and fetal outcomes, potential implications on service provision and birth experience.

Poster Orals 28 to 30

PO

28 | MicroRNA-148B-3P and MicroRNA-25-3P are overexpressed in fetuses with late-onset fetal growth restriction

Gabriela Loscalzo | José Morales-Roselló | José Luis García Gimenez | Lucia Martínez Priego | Daymé González-Rodríguez | Salvador Mena Mollá | Angel Maquieira Catalá | Silvia Buongiorno | Antonio José Cañada Martínez | Alfredo Perales Marín | Hospital Universitario y Politécnico La Fe, Valencia, Spain

Background: Adverse perinatal outcome and long-term neurological consequences are difficult to predict in fetuses with late-onset growth restriction (FGR). However, information currently provided by clinical data, cerebroplacental ratio (CPR) and estimated fetal weight (EFW) might be improved with the use of biochemical markers of suboptimal neuronal development.

Objective: To define a miRNA profile characteristic of late-onset FGR and to investigate the pathways involved in their biochemical action.

Method: In a prospective study, 25 fetuses: 16 normal and 9 with FGR (EFW <10th centile plus CPR <0,6765 MoM) were evaluated with Doppler ultrasound after 36 weeks gestation. Afterwards, in every fetus, plasma from umbilical vein blood was collected at birth, miRNA was extracted, and full miRNA sequencing was performed. Subsequently, comparisons were done in order to obtain those miRNA that were differentially expressed.

Result: FGR fetuses expressed upregulation of two miRNAs: miR-25-3p and miR-148b-3p, a miRNA directly involved in Schwann cell migration, which presented the highest significance (p=0.0072 and p=0.0013).

Conclusions: FGR fetuses express a different miRNA profile, which includes overexpression of miR-148b-3p, a miRNA related with neuronal plasticity. This information might add accuracy for the diagnosis and management of late-onset FGR.

PO

29 | Low third trimester PAPP-A does not predict IUGR in twins

Katarzyna Kosińska – Kaczyńska | Iwona Szymusik | Aleksandra Saletra-Bielinska | Patrycja Jarmozek | Izabela Walasik | Miroslaw Wielgos | First Department of Obstetrics and Gynaecology, Medical University of Warsaw, Poland

Objective: To determine if low concentrations of PAPP-A in the first trimester of pregnancy are related to intrauterine growth restriction in twins.

Method: A retrospective analysis of medical data of all women in twin pregnancies who received prenatal care at the Department between 2013 and 2018 was performed. PAPP-A concentrations were measured between 10+0 and 13+6 weeks. The associations between PAPP-A <10th percentile and new-born small for gestational age or intertwin birth discordance >25% were analysed.

Result: 304 patients were included to the study. 46.7% of pregnancies were monochorionic. The percentages of PAPP-A below 10th percentile was 10.2%. The mean gestational age at delivery was 35 weeks. The mean birthweight of the first twin was 2383 g, and 2289g of the second twin. Low PAPP-A was not associated with newborn small for gestational age (OR 2.1, 95% CI 0.9-4.9) or intertwin birth discordance >25% (OR 2.11, 95% CI 0.8-5.7).

Conclusions: Low first trimester PAPP-A does not predict intrauterine growth restriction of twins.

PO

30 | Risk of caesarean section & neonatal intensive care unit admission in FGR clinical subtypes: IUGR type I & SGA fetuses

Paz Ahumada | E Mazarico | A Darder | J Fuenzalida | C Cardona | F Figueras | MD Gomez Roig | Hospital Sant Joan de Déu, BCNatal, Barcelona, Spain

Objective: To compare adverse perinatal outcome in IUGR type I and SGA.

Method: A prospective cohort of prenatally diagnosed of FGR: weight centile <10th babies born between 2014-2018. IUGR type I is determined as the estimated fetal weight is <3rd or <10th centile with cerebro-placental ratio <5th and/or mean, uterine artery pulsatility index >95th centile pathological Doppler, while SGA group is the EFW between 3rd and 10th centile with normal feto-placental Doppler. Obstetric and perinatal outcomes were collected. Differences among groups in categorical variables were evaluated with the chi-squared or fisher exact test and numerical variables were analysed with Mann-Whitney U test. P<0.05 was considered significant.

Result: A total of 570 deliveries of FGR were recorded. Of these, a randomized sample of 100 IUGR type I and 100 SGA were analysed. Significative differences were found in: Caesarean rate (40% in IUGR type I, and 24% in SGA fetuses); gestational age at birth (mean 37,4 weeks in IUGR type I, comparing to mean 39,2 weeks in SGA) and NICU admission (mean 4,3 days, in IUGR type I fetuses and 0 days in SGA). Table 1. Perinatal outcomes analysed, their rates and respective p - value.

Conclusions: Adverse perinatal outcomes regarding caesarean rate, gestational age at delivery and NICU admission are worst in IUGR type I babies when compared with SGA. This should be considered in the management of these patients.

P

1 | Do tall pregnant women have heavy babies?

Andreja Trojner Bregar[1] | Miha Lučovnik[1] | Isaac Blickstein[2] | [1]Division of Obstetrics and Gynecology, University Medical Centre Ljubljana, Slovenia | [2]Department of Obstetrics and Gynecology, Kaplan Medical Center, Rehovot (affiliated with the Hadassah-Hebrew University School of Medicine, Jerusalem), Israel

Objective: We wanted to evaluate relationship between maternal height and fetal size.

Method: We performed a population-based cohort of 198.745 healthy mothers of singletons born in Slovenia between 2002 and 2012 to evaluate quartiles of the maternal height distribution for parity, BMI, gestational age and birth weight parameters. We generated birth weight by gestational age curves for each quartile. We excluded patients with hypertension or diabetes.

Results: Data analysis of 198.745 mothers. The quartiles were denoted as short (< 163cm), intermediate short (between 164cm and 167cm), intermediate tall (between 168cm and 170cm) and tall (>170cm). Mother from the 4 quartiles had similar parity, pre-gravid BMI, and gestational age at birth. Short mothers had a significantly higher rate of VLBW and LBW and 2501-4000 g infants, for an OR 1.38 (95% CI 1.17, 1.62), OR 2.2 (95% CI 2.05, 2.37), and OR 1.82 (95% CI 1.73, 1.87) between the shortest and tallest mothers. The opposite trend was noticed for birth weights >4000 g, for an OR 2.77 (95% CI 2.65, 2.89) between the tallest and shortest mothers. A very similar 'growth curve' was apparent until 33 weeks, a slower growth velocity was observed for shorter compared with taller women.

Conclusions: Maternal stature significantly influences birth weight. Height-related differences between mothers appears to begin after 33 weeks' gestation.

P

2 | A rare case of extensive fetal intracranial haemorrhage in an early onset FGR infant

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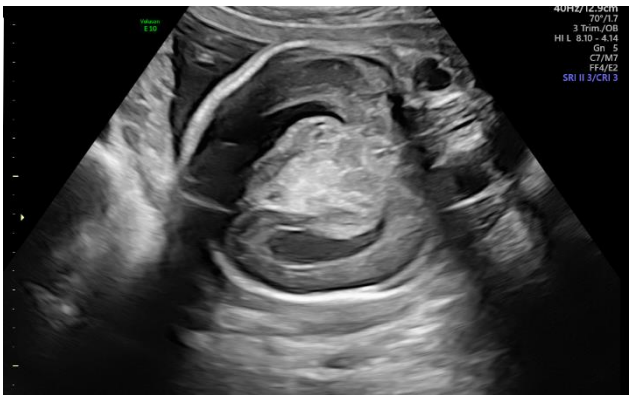
Introduction: Antenatal intracranial haemorrhage (ICH) can occur spontaneously or secondary to maternal or fetal conditions. The reported incidence is 1-5:10000 pregnancies. Fetal growth restriction (FGR) and prematurity are known risk factors for development of ICH in the postnatal period. There are limited case reports where ICH has been diagnosed antenatally, with the majority of these being in the supratentorial region.

Case: A primigravida was reviewed in our tertiary centre following diagnosis of early onset FGR with raised uterine artery dopplers with notching. The fetus was structurally normal with a normal microarray and infection screen. At 28 weeks' gestation with an estimated fetal weight of 624g, the umbilical artery doppler demonstrated reversed end diastolic flow. The middle cerebral artery (MCA) exhibited a pulsatility index <5th centile, the ductus venosus had an 'a' wave. She was admitted to the hospital for computerised CTGs and antenatal steroids. She was scanned again the following day due to absent fetal movements and a decreasing STV (2.9ms). The scan demonstrated intraparenchymal and intracerebellar haemorrhages of the supra and infratentorial areas with evolving ventriculomegaly (10-12mm). The MCA peak systolic velocity was 71 cm/s (>1.50 MoM). Following counselling with the parents and neonatal team a decision was made to await events due to a likely poor outcome. An IUD was diagnosed 12 hours later. A post mortem and MRI demonstrated a large volume ICH within the extra axial spaces surrounding the brain and within the ventricular system. There was also extensive haemorrhage within the folia of the cerebellum with loss of normal structure.

Discussion: In cases of severe FGR antenatal ICH is a rare complication, however hyper-echogenic areas within the brain tissue or an increase in MCA PSV should prompt further assessment and consideration of a diagnosis of fetal ICH which is likely to carry a poor prognosis.



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4 | Causes of late miscarriages

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Objective: Late miscarriage complicates 1-2% of all pregnancies. Among all pregnancy losses, the frequency of spontaneous abortions in the second trimester is 10-20%, and in the high-risk groups with miscarriage in history, it reaches 50%.

Methods: 42 cases of spontaneous miscarriage in the period from 16 + 0 to 21 + 6 weeks of gestation during singleton pregnancy were investigated. Depending on the presence of placental insufficiency (PI), according to a histological examination of the placentas, 2 groups were distinguished: in 1–12 histories with PI, in 2–30 histories without PI.

Results: The average age of women was 32.8 and 33.7 years. In 83.3% of women in group 1 and 80% of group 2, pregnancy occurred spontaneously. The course of this pregnancy is equally often complicated by the threat of termination in both groups in the first and second trimesters. Urinary tract infection was detected in 33.3% and 43.3% of women, infection of the genital tract in 33.3% and 53.3% of women, respectively. The average period of interruption of the studied pregnancies was 18 + 6.3 weeks in group 1, 19 + 2.4 in group 2. Miscarriages began with premature rupture of amniotic fluid in 83.3% and 76.7%, with cramping pain in 16.7% and 23.3%, respectively. According to a histological examination of the afterbirth and fetuses: ascending hematogenous infection was detected in 33.3% cases in group 1, in 46.7% in group 2. Expressed criteria for infection in the placenta were diagnosed in half of the cases in both groups.

Conclusion: The main cause of late miscarriages is the presence of urogenital infection identified during pregnancy, which can be realized both by the path of hematogenous spread and development of placental insufficiency, and by the path of ascending infection of the fetal membranes, amniotic fluid and fetus.

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5 | Causes of late miscarriages in multiple pregnancies

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Objective: Among all pregnancy losses, the frequency of spontaneous abortions in the second trimester is 10-20%, and in high-risk groups it reaches 50%. Late miscarriage complicates 1-2% of multiple pregnancies.

Methods: We investigated 11 cases of spontaneous miscarriage in the period from 16 + 0 to 21 + 6 weeks of gestation in multiple pregnancies. Depending on the presence of placental insufficiency (PI), according to a histological examination of the placental, 2 groups were distinguished: in 1–3 histories with PI, in 2–8 histories without PI.

Results: The average age of women was 34.7 and 32.25 years. Miscarriage history in anamnesis was observed in 66.7% and 62.5% of women, respectively. In 66.7% of women in the 1st group and in 62.5% of the 2nd groups, pregnancy resulted from assisted reproductive technologies. The course of this pregnancy was complicated by the threat of termination in the first trimester at 66.7% and 50%, respectively. The presence of a uterine risk factor for miscarriage (cervical insufficiency, saddle uterus) complicated the course of pregnancy in 66.7% of pregnant women in group 1, in 75% in group 2. Urinary tract infection was detected in 25% and 12.5% of women, respectively; infection of the genital tract - in 25% of women in both groups. The average period of interruption of the studied pregnancies was 18 + 4.3 weeks in group 1, 16 + 6.5 weeks in group 2. Miscarriages began with premature rupture of amniotic fluid in 66.7% and 50%, with cramping pains in 33.3% and 50%, respectively. According to a histological study, ascending infection was detected in 25% of cases in group 1, in 50% of cases in group 2.

Conclusion: The permanent threat of miscarriage in conjunction with urogenital infection in the presence of a uterine risk factor for miscarriage are the main causes of late miscarriages in multiple pregnancies.

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6 | Neonatal outcomes of smaller twins in cases of birthweight discordance

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Objective: To evaluate the neonatal outcomes of smaller twins in cases of birthweight discordance.

Methods: A retrospective analysis of medical data of all twins delivered beyond 22 weeks of gestation between 2009 and 2019 was performed. Birthweight discordance was defined as a difference between weights of both twins ≥ 25%. Neonatal complications occurring during the first 28 days of life were analysed.

Results: 63 pairs of twins (28 monochorionic and 35 dichorionic) were analysed. In 6 cases intrauterine demise of the restricted fetus occurred (9.5%). 4 newborns weighting <4000g died after delivery and 2 with birthweight <660g during the first 28 days of life. The mean gestational age at delivery was 33.3 weeks (±2.9), the mean birthweight of the bigger twins was 2181±695g and of the smaller twins -1374±624g. 50.9% of smaller twins were born weighting <1500g and 28.3% <1800g. 22.6% of smaller twins had mechanical ventilation and 15% continuous positive airway pressure applied. 3.8% of smaller twins had necrotising enterocolitis, 5.7% sepsis, 11.3% intraventricular haemorrhage, 32.1% jaundice treated by phototherapy and 15.1% transfusion of red blood cells. 49% were hospitalised at Neonatal Intensive Care Unit. Analysed neonatal complications did not occur in any smaller twins weighting >1800g and in 20% of twins weighting >1500g.

Conclusion: Twin birthweight discordance exceeding 25% is related to bad neonatal outcome, particularly in newborns with extremely low birthweight.

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7 | Comparison of detection rates using different growth charts

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Objective: Different growth charts have been developed to facilitate fetal abnormal growth detection. Available growth charts have different cut-of points and therefore decision to use one of them changes detection rate. We have conducted study to compare detection rates using growth charts recommended in Poland and newly developed growth charts.

Methods: Electronic database of 1224 patients including ultrasound date and hospital discharge data was constructed. Estimated fetal weight and birthweight where plotted against 10th and 90th centiles of recommended Fenton growth chart and most widely used in Poland Yudkin growth chart. Additionally, we have plotted these values on Intergrowth-21st and newly developed Kajdy et al. Polish Population Reference growth chart.

Results: Kajdy growth chart classified most neonates as SGA (16,09%), less neonates were classified SGA by Yudkin growth chart (7,68%). Most neonates were classified as LGA by Intergrowth-21st (23,37%), least by Kajdy growth chart (13,40%).

Conclusion: Using newly developed Kajdy et al. growth chart classified more neonates as SGA and less as LGA. Use of Intrergrowth-21st grow charts would result in large proportion of LGA and low of SGA. Fenton growth charts were closest to identifying 10% of population as SGA and 10% as LGA.

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8 | Trends, attitude and knowledge about the methods of labour pain management among Polish women

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Objective: The aim of the study was to assess the knowledge of Polish mothers about pharmacological and non-pharmacological LPM, to investigate which methods they chose and their satisfaction of chosen ones.

Methods: A prospective cross-sectional study was performed among women, who gave birth between 2015 and 2018. The self-composed questionnaire was distributed via Internet in October 2018.

Results: 13 727 women participated in the study. 75% have learned about LPM from the Internet. 68% of them did not gain any information on LPM from doctors during their prenatal appointments Safety of the newborn (46%), midwife's advice (40%) and the chance of the immediate pain relief (39%) were the most important issues while choosing LPM. Respondents used a wide range of non-pharmacological methods, such as assistance of partner during labour (81%), physical activity (58%), immersion in water (37%) and others. 11% of mothers did not use any of the LPM methods. 52% of women declared, that they wanted to use the pharmacological anaesthesia, while 49% had it performed (28% epidural, 16% inhaled anaesthesia, 5% parenteral opioids). Pharmacological methods were unavailable due to lack of anaesthesiologist in maternity ward (41%) or inaccessibility of the chosen methods in the hospital (31%) and too advanced labour (43%). 48% of respondents did not decide to use pharmacological methods, because pain was bearable (29%), anxiety of child's health (17%), or belief that the pain is natural and it should not be avoided (16%). 83% of respondents believed that epidural analgesia have no influence on time needed to gain a full cervix dilatation and 81% of them claimed that serious spinal cord injury is a common side effect of epidural.

Conclusion: The knowledge about the methods of LPM is not satisfactory. We should focus on well- maintained education guided by doctors, midwives and media.

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9 | Perinatal outcome in early onset fetal growth restriction – single centre experience

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Early onset FGR occurring before 32 weeks of gestation is a distinct clinical entity due to underlying placental insufficiency in most cases. Management is often challenging due to significant risk of perinatal morbidity and mortality. We share our experience of managing severe FGR before 32 weeks in our Fetal Medicine Department with evidence based protocols employing intensive surveillance using serial ultrasound evaluation including advanced fetal Dopplers and computerised CTG and set triggers for timing delivery.

Objective: To analyse the antenatal management and perinatal outcome in cases of early onset FGR in singleton pregnancies over 3 years from January 2016 – December 2018.

Methods & Results: Retrospective analysis of electronic patient records. We had 37 babies early onset FGR which delivered at or before 32 weeks gestation. Pre-eclampsia co-existed in 12/37n (32%) of these cases. 19/37 (51%) babies were delivered before or at 28 weeks gestation. The most common trigger for delivery was abnormal computerised CTG (STV < 4 and / or presence of overt decelerations) in n/N (34% cases. 16/37 (43%) babies weighed below 600grams at birth. Of these very small babies, there were 7 cases of still births (all birth weights below 500grams), 3 neonatal deaths and 2 infant deaths. Of the surviving 4 babies, two babies suffer from chronic lung disease. Two babies are surviving without any chronic illnesses. All babies who weighed more than 600gms survived but majority suffered from respiratory distress syndrome, metabolic disturbances, sepsis and prolonged stay in NICU & SCBU.

Conclusion: Our study supports the observation that birth weight and gestational age are the most important prognostic factors in predicting the fetal outcome in early onset FGR. Following evidence based protocols for management in the Fetal Medicine Department focusing on effective fetal surveillance & delivery at the optimum gestation improves the fetal outcome in these babies. A well-equipped tertiary neonatal unit to support these vulnerable babies is also essential to optimise neonatal outcome.

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10 | Preventing fetal growth restriction and other adverse outcomes in women with a low PAPP-A: are we, in Hull, doing too much or not enough?

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Background: Pregnancy Associated Plasma Protein A (PAPP-A) is a hormone produced by the placenta and it is one of the markers used for Down's Syndrome screening. RCOG Greentop Guideline on "Small for Gestational Age" (SGA) recommends low PAPP-A (<0.4 Multiple of Median) as a major risk factor for SGA. As per the guideline, women with low PAPP-A should have serial growth scan from 26-28 weeks for assessment of fetal size and umbilical artery Doppler. In addition to low PAPP-A associated with SGA, it is also associated with fetal chromosomal abnormality; pre-eclampsia and stillbirth. In HUTH, we recommend all women with low PAPP-A to commence Aspirin as soon as possible and for serial growth scans from 28 weeks as per RCOG guideline. If growth is not a concern, the women remain under consultant led care and are offered an induction of labour at 40 weeks of gestation.

Objective: Our primary outcome is to assess the correlation between PAPP-A level to the weight at birth and rate of stillbirth in the last 2 years by separating our data into: PAPP-A i) ≤0.39 - ≥0.3 MoM, ii) ≤0.29 - ≥0.1 MoM, iii) ≤0.09 MoM. By looking at the level of PAPP-A , our secondary outcome will look into the maternal outcome (percentage of women diagnosed with pre-eclampsia; mode of delivery – including induction of normal growth for low PAPP-A).

Method: Women with low PAPP-A (<0.4 MoM) are identified by our Regional Biochemistry Laboratory and case notes reviewed for the above outcomes.

Results & Conclusions: Data collection and analysis are currently ongoing. They will be presented along with our conclusion at the Conference.

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