Prenatal Screening in the First Trimester

What's Available and who pays?

Ken Seethram, MD, FRCSC

Pacific Centre for Reproductive Medicine

Clinical Associate Professor UBC/UA

kseethram@pacificfertility.ca

PCRM Pacific Centre for Reproductive Medicine

Faculty/Presenter Disclosure

Relationships with commercial interests:

Grants/Research Support:

Igenomix Global

Speakers Bureau/Honoraria/consulting fees:
None

My expertise is in prenatal screening so some of what you hear today involves my practice

Disclosure of Commercial Support

This program has not received financial support

This program has not received in-kind support

Potential for conflict(s) of interest: none

Mitigating Potential Bias

I am an accredited provider of the Fetal Medicine Foundation UK

PCRM Pacific Centre for Reproductive Medicine

Prenatal Screening *definition*

To detect problems with the **pregnancy**

Prenatal Screening *definition*

To detect problems with the

fetus
placenta
mother

Prenatal Screening *definition*

- Despite the simplicity, historically medicine has replaced this with the hunt for Down syndrome
- This started in the late 1800s when John Langdon Down first described the most common (then unknown) aneuploidy
- It became amplified in the era of amniocentesis and CVS
- To the point that between the 1970s and 2000s, all women deemed at high risk due to age, were offered prenatal genetic invasive testing – and largely for T21

Prenatal Screening *definition*

But to bring the discussion back to basics: prenatal screening is meant

To detect problems with the **pregnancy**

Prenatal Screening *definition*

To detect problems with

Genetic
Structural

fetus
placenta
mother

Placental
adaptation

To simplify then….prenatal screening is done

Prenatal Screening *definition*

To detect problems with

Genetics

Structural Fetal Defects

Placental Disease

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

Focus of this talk

In the first trimester, how do we screen for:

Genetics

Structural Fetal Defects

Placental Disease

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

What genetics are we screening for?

- The big things: **aneuploidy**
  - Major chromosome number deviations such as Trisomy's 21/18/13 (T21/18/13) and monosomy X (45X)
  - *Increased incidence with age*

- The little things: **subchromosomal**
  - Deletions/duplications of chromosomal segments
  - Single gene disorders
  - Chorionicity in twins
  - *These are independent of age*

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

aneuploidy

Aneuploidy

- General population prevalence is for Trisomy 21: ~1/700 in Canada
- T21 and 45X are the only two which are compatible with life
- Other sex chromosome aneuploidy like XXY/XXX/XYY are generally low impact Population prevalence estimates put T21 at 8.3/10000 (31,100) in Canada
- 38% of North Americans know somebody with T21

- **It is a continuum from conceptus onwards - How common is - embryonic stage?**
  - Current estimates say that 40-50% of all embryos in a woman aged 40, will have aneuploidy

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL aneuploidy*

How common is normal versus not? *These are stats at 10wks*

Age	Chance of T21	Chance of normal
30	1:576	99.82%
35	1:229	99.56%
40	1:62	98.39%
42	1:35	97.14%
45	1:15	93.33%

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

aneuploidy

- In the **advanced maternal age** patient (aged 35-45) the chance of a normal non-T21 outcome will range from 93-99%

- The primary message - pregnancy is a normal condition the vast majority of times, even as a woman ages beyond 40, the outcomes are excellent

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL subchromosomal*

Genetics - what about the little things?

- Deletions/duplications of chromosomal segments
- Single gene disorders
- Chorionicity in twins

- These are all outcomes from non-invasive prenatal testing (NIPT) and they are all rare
- Examples of deletions: 22q11.2, Prader Willi, Angelman's, 1p36 etc.
  - <1:5000-1:10000 newborns
- Note that although rare, they are ***not*** age-related

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

Who should have genetic prenatal screening?

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

who gets screening?

SOGC **All pregnant women in Canada, regardless of age, should be offered, through an informed counselling process, the option of a prenatal screening test for the most common fetal aneuploidies**

ACOG Aneuploidy screening or diagnostic testing should be discussed and offered to all women early in pregnancy, ideally at the first prenatal visit

ISPD ...routine practice to provide a woman's personal risk for aneuploidy (screening) and to offer definitive diagnosis through amniocentesis or CVS if the risk exceeds a fixed cut-off

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

Aneuploidy ✓

Subchromosomal ✓

everyone should be offered it ✓

How do we screen?

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

How do we screen?

There are two methods:

A Placental Genetic Markers in Blood

I. Use of biochemical markers which move up or down in different genetic syndromes
II. Done in the first trimester (1TM) or second trimester (2TM), both
III. Includes: HCG, PAPP-A, Inhibin-A, estriol, Alpha fetoprotein (AFP)
IV. The HCG we measure in the 1TM is different than 2TM, same info

B Fetal Genetic Markers on Ultrasound

I. Ultrasound in 1TM or 2TM
II. Includes: Nuchal Translucency, Nasal bone, ductus venosus flow, anatomy survey in 1TM and 2TM, soft genetic markers in the 2TM

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

11-14W US	11-14W blood	15-22W blood
		HCG
		AFP
		uE3
		Inhibin-A
75%	Quadruple Pregnancy Screen (QUAD)	

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

11-14W US	11-14W blood	15-22W blood
	PAPP-A	HCG
		AFP
		uE3
		Inhibin-A

80-82% Serum integrated pregnancy screening (SIPS)

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

11-14W US	11-14W blood	15-22W blood
Nuchal Translucency	PAPP-A	HCG
		AFP
		uE3
		Inhibin-A

84-88% Integrated pregnancy screening (IPS)

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

11-14W US	11-14W blood	15-22W blood
Nuchal Translucency	PAPP-A	HCG
	bHCG	AFP
		uE3
		Inhibin-A

84-88% Integrated pregnancy screening (IPS)

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

11-14W US	11-14W blood	15-22W blood
Nuchal Translucency	PAPP-A	HCG
	bHCG	AFP
		uE3
		Inhibin-A

84-88% Integrated pregnancy screening (IPS)

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

11-14W US

11-14W blood

Nuchal Translucency

PAPP-A

bHCG

All <14w

85%

First trimester screening (FTS)

PCRM Pacific Centre for Reproductive Medicine

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

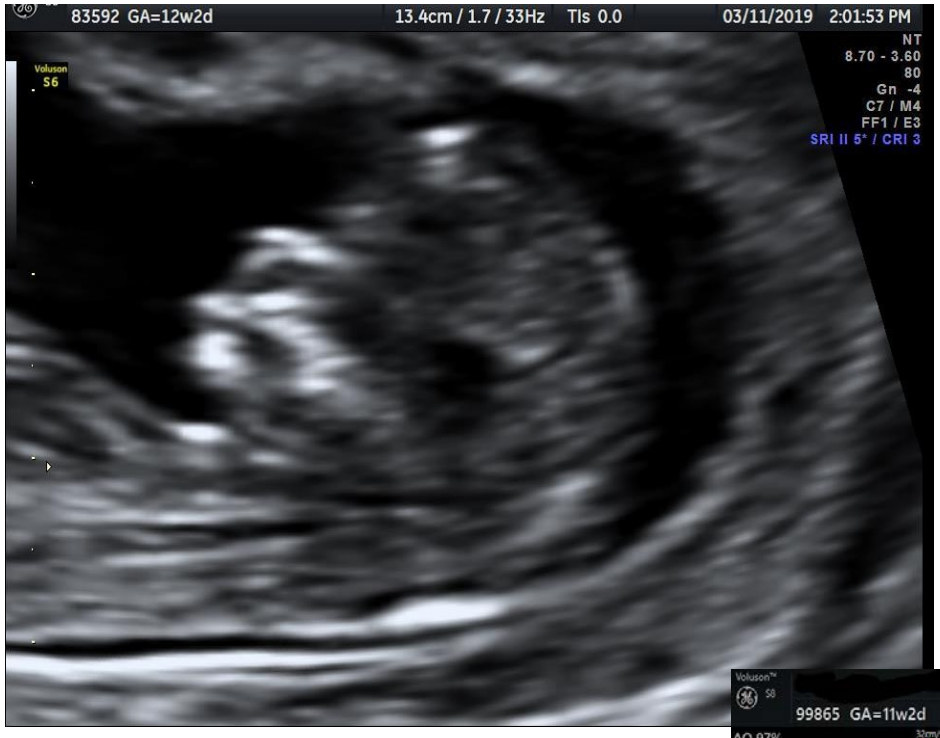
11-14W US

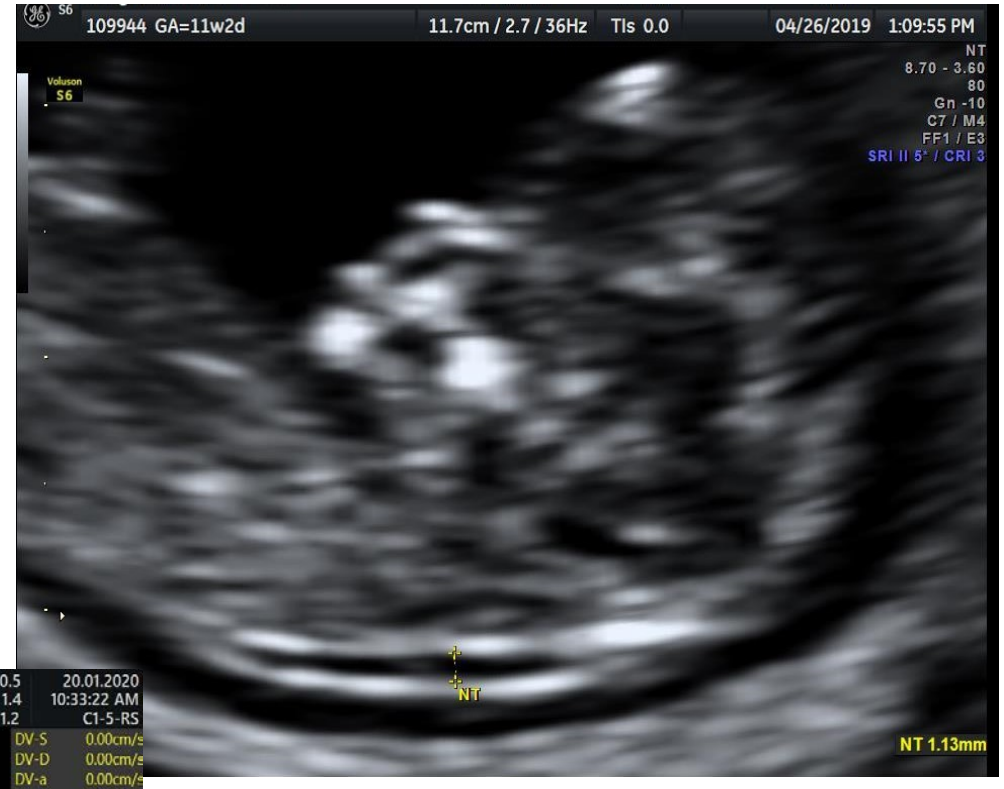
- Nuchal Translucency
- Nasal Bone Detection
- Ductus Venosus Flow

11-14W blood

- PAPP-A
- bHCG

96% Combined First trimester screening (FTS)





PCRM Pacific Centre for Reproductive Medicine

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

Summary: two methods:

A Screen Early 11-14w

First Trimester Screening (DR 85%)

Combined First Trimester Screening (DR 96%)

B Screen Late 15-22w

QUAD (DR 75%)

SIPS (DR 80-82%)

IPS (DR 84-88%)

Timing will impact decision making if abnormal results require more testing or termination

Prenatal Screening

GENETICS *STRUCTURAL* *PLACENTAL*

First Trimester Screening	FTS
Serum Integrated Prenatal Screening	SIPS
Integrated Prenatal Screening	IPS
Non invasive prenatal testing (NIPT)	NIPT
Combinations/contingency models	

What about using circulating placental DNA? - NIPT

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

NIPT non-invasive prenatal testing

DNA is liberated from the placenta -can be fractioned away from maternal DNA

- This "cell-free" DNA is placental, not fetal, but fully represents the fetus
- The fragments are 150 base pairs but the entire fetal genome is represented
- By counting technologies, Array sequencing, or Next Gen Sequencing the genome of the fetus can be reconstructed to detect:
    - Aneuploidy
    - Microdeletions
    - Some single gene mutations
    - Placentation in twins
- count genomic segments/sequence them: the detection rates are high
- PPV will depend on the prevalence
    - For instance, a 25 year old with positive T21 NIPT has a 33% chance of this being true. A 40 year old has a 87% PPV

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

NIPT non-invasive prenatal testing

Performance?

Aneuploidy

- Performance for T21 is over **99% detection** rates for 0.1% false positive rates
- Tells us about the placental DNA but not the baby
- Performance for T13/T18/Sex chromosomes less well but still high (about 90%)

What about microdeletions

- SNP sequencing is the only NIPT which can look at subchromosomal
- Syndromes from microdeletions can be quite severe BUT rare

What about Twins

- Sequencing with Single nucleotide polymorphisms (SNPs) provides one thing: **zygosity** (if in doubt)

Low Fetal Fraction – 3-5% of all tests will not be reported

Prenatal Screening GENETICS *STRUCTURAL PLACENTAL*

NIPT non-invasive prenatal testing

What are the major NIPTs available?

- **Targeted (counting method)** – example - **Harmony©**
  - Where we look for gene loci unique to certain chromosomes (like 21) and compare that number with the reads from other chromosomes (like 1)
  - If you get more reads from the locus on 21 in a ratio of 1.5X versus 1, then you have trisomy 21
- **SNP based** – example - **Panorama©**
  - Where DNA sequence variations (normal in all of us) are compared between placental and maternal DNA. Variations of up to 1% are normal
  - This can then help segregate and compare maternal versus placental DNA
  - Benefits – microdeletions, zygosity, slightly lower fetal fraction threshold
- **Whole Genome sequencing** – **example NIFTYpro©**, Verifi, Invitae NIPS
  - All chromosome numeric abnormalities
  - and microdeletions

Prenatal Screening

GENETICS *STRUCTURAL PLACENTAL*

NIPT non-invasive prenatal testing

NIPT SUMMARY

- 3-5% non-reporting
- Excellent performance otherwise
- Focus: T21, T13, T18
- Microdeletions – fun but rare

Prenatal Screening *GENETICS* STRUCTURAL *PLACENTAL*

The big limitation of blood based screening (SIPS or NIPT):

- Is that we don't see the baby
- **all screening tools which do not use ultrasound will miss up to 40% of abnormal pregnancies**
- NIPT - High $ for detecting of T21
- Misses up to 10% of atypical chromosomal anomalies like triploidy, and Non T21/18/13
- 3-5% risk of non reporting (with NIPT) and lower detection rates with SIPS

Prenatal Screening *GENETICS* **STRUCTURAL** *PLACENTAL*

Therefore there is a shift in focus -early structural defect screening

- ISUOG 2019 (Syngelaki, Nicolaides) 28% of all major anomalies identified at 12w, 54% at 18-22w
- ISUOG 2019 (Minnella, Nicolaides), n=93000, 54% of all complex congenital hearts identified in 1st TM using NT and DV
- Ductus venosus screening will detect 93-96% of all cardiac anomalies at 11-14w
- Kenkhuis March 2018 – **100% of severe structural anomalies will be picked up at the 11-14w scan**
- Abuhamad 2017 – 100% DR for acrania, omphalocele, gastroschisis, megacystis, body stalk anomaly, cloacal defect, amongst others
- *It's important to understand that NIPT is really good at T21, but not great at other things – it catches the 60% of genomic anomalies, but at the cost of missing 40%*

Summary: Genetics and Structural, Guidelines help us:

A. First Trimester Ultrasound (11-14w) offers many advantages including dating, Chorionicity, early detection of major structural abnormalities, and aneuploidy risk

B. Second Trimester AFP is no longer required if a 20w ultrasound is done

C. In twin pregnancies, Nuchal Translucency alone is considered an acceptable first line test, better with serum proteins like HCG/PAPP-A

D. NIPT is a highly effective form of early prenatal screening of common trisomy's after 10w. **NIPT as a primary screening is not cost effective, but offering it in a contingency program will give high performance at a reduced cost – important point – NIPT alone is not considered appropriate screening**

Prenatal Screening GENETICS STRUCTURAL *PLACENTAL*

This is important:

A. NIPT is a highly effective form of early prenatal screening of common trisomy's after 10w. NIPT as a primary screening is not cost effective, but offering it in a contingency program will give high performance at a reduced cost – important point – NIPT alone is not considered appropriate screening

B. What has been happening is that big genome has everyone convinced that NIPT is the best possible screen – and if you're looking for T21, they are right. But if we're really doing screening (genetics, structural, placental) then they are wrong

Prenatal Screening GENETICS STRUCTURAL *PLACENTAL*

What about the PLACENTA?

Prenatal Screening *GENETICS STRUCTURAL* PLACENTAL

Abnormal placental function leads to restricted nutrition and oxygenation of the fetus – this is at the core of Pre-eclampsia (PE) and Intrauterine Growth Restriction (IUGR). We now have ample tools to screen and treat both of these situations

Prenatal Screening *GENETICS STRUCTURAL* PLACENTAL

- Pre-eclampsia (PE)
  - Multisystem prenatal disorder defined by the onset of hypertension accompanied by significant proteinuria after 20w
  - Affects 2-5% of women
  - One of the leading causes of maternal and perinatal morbidity and mortality
  - Annual attributable global mortality: **76,000 women, 500,000 babies**
  - Early PE (prior to 34w) is associated with substantial risks of short and long term maternal and perinatal morbidity
- Pre-eclampsia (PE) Etiology – TWO stages
  1. Shallow invasion of trophoblast giving poor remodeling of spiral arteries in placenta
  2. Maternal response to endothelial dysfunction and imbalance between angiogenic and antiangiogenic factors
  3. The high BP-late finding due to ↑ feto-placental demands on inflexible system

Prenatal Screening *GENETICS STRUCTURAL* **PLACENTAL**

- PE Maternal Morbidity
  - Most common death secondary to intracranial bleeding
  - HELLP syndrome, pulmonary edema, RDS, acute renal failure
  - Women with PE have a RR of 3.13 to develop chronic HTN, and 1.8X OR of developing a cardiovascular accident

- PE Perinatal Morbidity
  1. Fetal growth restriction, oligohydramnios, IUFD, preterm birth, NICU needs
  2. Cerebral palsy, low IQ, hearing loss, visual impairment, insulin resistance, DM, Coronary artery disease and HTN

Prenatal Screening *GENETICS STRUCTURAL* PLACENTAL

- There are new ways to screen for pre-eclampsia and new ways to prevent it
- **Guidelines for the Universal first trimester screening of pre-eclampsia, 2019**

"FIGO is pleased to launch our first evidence-based guidelines to support first trimester screening and prevention of pre-eclampsia. Health is a human right, and every woman, wherever she lives, deserves the highest standards of health and wellbeing. These guidelines provide another essential tool to health professionals, health policy makers and FIGO's 132 member societies in addressing the NCD (non-communicable disease) epidemic long-term, and accelerating progress in reducing maternal mortality." Carlos Fuchtner, President, FIGO

Prenatal Screening *GENETICS STRUCTURAL* PLACENTAL

PE Screening – there are only three options:

Maternal Characteristics and Medical History

Poor detection rates (39% for early PE with 10% false positive rate)

Biomarkers

Mean Arterial pressure

Uterine artery pulsatility index (UTPI)

PAPP-A

Placental Growth Factor (PLGF)

Combined Assessment

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

maternal history

Data is based on regression algorithm from a study of screening 120,492 patients at 11-13 weeks including:

- age, height, weight,
- ethnicity, past history
- Inter-pregnancy interval
- Family history
- Gestational age at last delivery
- Method of conception
- Smoking
- History of HTN, DM, SLE or APAA

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

blood pressure

Criteria:

- Recommended using a semi-automated device
- Sitting position with arms supported at level of heart
- Appropriately sized cuffs depending on mid-arm circumference
- Rest for 5 minutes
- BP measured in **both arms simultaneously** x 2 at 1 minute intervals (giving 4 sBP and 4 dBP)

Studies: MAP in combination with history gives a 63% DR for PE with 10% false positive

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

PLGF and PAPP-A

Placental Growth Factor (PLGF)

- Is secreted by trophoblast and part of angiogenic vascular endothelial growth factor family (VEGF) – has antiangiogenic functions
- Women who develop PE will have low PLGF in the first trimester
  - Using PLGF alone at 11-14w for early PE screening has:
    - 56% detection rate
    - 9% false positive rate

Pregnancy-associated Plasma protein A (PAPP-A)

- Also has a role in placental growth/development and low in women who go on to develop early PE
- Alone has poor detection rates, but with maternal history has higher detection rates for PE

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

Uterine Artery Pulsatility Index (UTPI)

UTPI

- Done using ultrasound at 11-14w **during** the First Trimester screen
- Using UTPI **alone** at 11-14w for early PE screening has:
    - 48% detection rate
    - 8% false positive rate

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

Combined Risk Assessment

Combined Risk assessment

- Current best practice recommendation is to develop a personalized risk assessment at 11-14w based upon:
  A. Maternal Characteristics and History
  B. MAP
  C. PLGF
  D. UTPI
  E. With or without PAPP-A
- The biomarkers are placed into (MoMs) and into risk screening software
- High risk is when higher than **1:100**

Prenatal Screening

GENETICS *STRUCTURAL* **PLACENTAL**

Please record the following information and then press Calculate.

Pregnancy type

Singleton or twins

Pregnancy dating

Fetal crown-rump length ____ mm (45-84 mm)

Examination date dd-mm-yyyy

Maternal characteristics

Date of birth dd-mm-yyyy

Height ____ cm ____ ft ____ in

Weight ____ kg ____ lbs

Racial origin

Smoking during pregnancy ○ Yes ○ No

Mother of the patient had PE ○ Yes ○ No

Conception method

Medical history

Chronic hypertension ○ Yes ○ No

Diabetes type I ○ Yes ○ No

Diabetes type II ○ Yes ○ No

Systemic lupus erythematosus ○ Yes ○ No

Anti-phospholipid syndrome ○ Yes ○ No

Obstetric history

○ Nulliparous (no previous pregnancies at ≥24 weeks)

○ Parous (at least one pregnancy at ≥24 weeks)

Biophysical measurements

Mean arterial pressure ____ mmHg

Mean uterine artery PI ____

Date of measurement dd-mm-yyyy

Biochemical measurements

Includes serum PLGF ◉ No ○ MoM ○ Raw data

Includes serum PAPP-A ◉ No ○ MoM ○ Raw data

Calculate risk

PCRM Pacific Centre for Reproductive Medicine

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

Treating High Risk

Prevention/treatment of the at-risk woman using ASA

- Aspirin is thought to ↓ PE by inhibiting the biosynthesis of placental thromboxane A2
- This alters the prostacyclin/thromboxane A2 ratio
- May prevent or delay on the onset of PE
- 1979 – first study demonstrating the benefit of ASA on PE
- Landmark meta-analysis (31 trials) showed 10% reduction in PE (2007)
- Bujold – first study to analyze the use prior to 16w
- Meta-analyses since showed that administration prior to 16w gives:
    - *RR reduction of 0.22 for PE*
    - *50% reduction in risk of FGR*
    - ***60% reduction in fetal death***

Prenatal Screening

GENETICS STRUCTURAL PLACENTAL

Treating High Risk

Prevention/treatment of the at-risk woman using ASA

- First large prospective trial (ASPRE)
- Showed that ASA started at 11-14w gives:
  - 62% reduction in the rate of preterm delivery due to PE
  - Significantly lower NICU stay in the ASA group versus placebo (by 68%)
  - 150mg nightly from 11-14w until 36w
  - No difference in adverse events versus placebo
  - But does not affect term PE risk
  - Spotting should not stop the ASA
  - Abruption and PPH risk did not increase in the ASA group

Prevention/treatment of the at-risk woman using ASA

- In women with low Calcium intake, replacement or supplementation (1.5-2g daily) may reduce the burden of early and late PE

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

is it worth it?

Cost Effectiveness

- Canadian trial (Ortved, Johnson, 2019) suggested that the introduction of First trimester screening with PE screening would reduce health care consumption by 220M
  - (based on both aneuploidy detection and NICU stay for PE)
- No current analytics take into account the long-term effects of PE on the newborn and its future cardiovascular health

Prenatal Screening *GENETICS STRUCTURAL* PLACENTAL *guidelines*

Current FIGO Guidelines and Recommendations

- Public Health Focus: Draw greater attention to the scope and issue
- Universal Screening
  - All pregnant women should be screening for preterm PE during early pregnancy with the first-trimester combined test with maternal risk factors and biomarkers
  - **All countries** should adopt and promote this
- Contingent Screening: Where resources are limited, routine screening done by Maternal factors and MAP followed by PLGF and UTPI for the positive subgroup
- Prophylaxis
  - high risk women should receive ASA prophylaxis at 11-14w at a dose of 150mg nightly until 36w
  - Calcium supplementation or replacement if indicated

Prenatal Screening

GENETICS STRUCTURAL **PLACENTAL**

Availability

Currently Alberta and Ontario are developing PE screening programs piggy-backed on their FTS programs

The only PE screening in Canada occurs in our centre (combining FTS+NIPT+PE Screening)

Is Canada ready for PE screening?

Prenatal Screening

GENETICS STRUCTURAL PLACENTAL

Availability

Who pays for what?

Prenatal Screening

GENETICS STRUCTURAL PLACENTAL

SCREENING TOOL	ELIGIBLE	COST	NOTES
SIPS	ALL WOMEN	MSP INSURED	
QUAD	ALL WOMEN	MSP INSURED	If first presenting after 14w
IPS	• OVER AGE 35 • TWIN PREGNANCY • IVF WITH ICSI	MSP INSURED	
NIPT	• IF SIPS/IPS/QUAD/US GIVES RISK OVER 1:300 • HISTORY OF T13/18/21	MSP INSURED	
FTS	ALL WOMEN	$550	
NIPT	ALL WOMEN	$495-800	Depending on addition of microdeletion panels
PE SCREENING	ALL WOMEN	As part of TriO	TriO = FTS+NIPT+ PE SCREENING
TRIO (11-14W)	ALL WOMEN	$1000	FTS+NIPT+PE SCREENING

Prenatal Screening

GENETICS STRUCTURAL PLACENTAL

How and Where?

MSP Insured Screening: Perinatal Services BC website

NIPT private pay:	Lifelabs	$550/795 (*no genetic counseling)
	Olive Fertility	$650
	Fertility with Grace	$600 (Verifi)
	PCRM	$650/950 with microdeletions
FTS/NIPT/PE screening:	PCRM	$1000 with genetic counseling

Prenatal Screening

GENETICS STRUCTURAL PLACENTAL

Pearls

- Offer screening to all women
- Invasive testing follows if the screening test is positive
- Conventional screening (FTS/IPS/SIPS) methods remain the most appropriate choice for first-line screening, with NIPT as contingency
- All of the genetic risks we seek to screen are rare – provide reassurance
- NIPT – *don't apply it alone* – it is an excellent augmentation to conventional screening, but isn't as broad as any screening which includes ultrasound
- Recognize that some of the single gene and microdeletion panels are extremely rare and not a sole reason for doing NIPT
- Work within what your patients want – 50% of all pregnant patients in this province decline any type of screening.
    - Educate, let them know what is available, and help them reach a decision

Prenatal Screening

GENETICS STRUCTURAL PLACENTAL

Pearls

- What if the mother wishes screening but will not terminate?
  - It's mythical that people choose screening to inform termination
  - Most want the information to prepare, some will terminate
- What is the best NIPT?
  - For most, the cheapest (counting ex. Harmony) is the best
  - For some, sequencing and CGH is better (ex. Twins)
  - Microdeletions? Remember they are rare
- Other influences on decision making – fetal sex
- Why is Canada behind in pre-eclampsia screening? Are we ready for it?

Prenatal Screening

GENETICS STRUCTURAL PLACENTAL

Resources

1. Perinatal BC Prenatal Genetic screening website has a video and decision aides
2. Fetalmedicine.org
3. Prenatalscreeningontario.ca
4. My talk – at pacificfertility.ca >top of the page – physician resources
5. Genetics@pacificfertility.ca – you or your patient can email our counselors

Information

- If you get lost and don't know what to do?
  - Perinatal BC Prenatal Genetic screening website has a video and decision aides
  - Genetics@pacificfertility.ca – you or your patient can email our counselors, or call us to assist
  - My talk – at pacificfertility.ca >top of the page – physician resources