

# ANTENATAL OBSTETRIC ULTRASOUND: INDICATIONS FOR DOPPLER ASSESSMENT

## CONTENTS

Definitions.....	2
<b>Singleton Pregnancies .....</b>	<b>3</b>
Umbilical Artery Doppler (UA) .....	3
Use.....	3
Measurement .....	3
Clinical indications .....	3
Ultrasound scan indications .....	3
Doppler not indicated.....	3
Troubleshooting tips.....	4
Middle Cerebral Artery Doppler (MCA) .....	4
Use.....	4
Measurement .....	4
Indications .....	4
MCA Peak Systolic Velocity (MCA V max) .....	4
Use.....	4
Measurement .....	4
Indications .....	4
Cerebroplacental Ratio (CPR) .....	4
Measurement .....	4
Indications .....	4
Ductus Venosus Doppler (DV).....	5
Use.....	5
Measurement .....	5
Indications .....	5
Uterine Artery Doppler .....	5
Use.....	5
Measurement .....	5
Indications .....	5
Timing .....	5
<b>Twin Pregnancies .....</b>	<b>5</b>
Dichorionic Diamniotic Twins .....	5
Monochorionic Twins (MCDA and MCMA).....	5
<b>Dopplers for Specific Clinical Situations.....</b>	<b>6</b>
History of Reduced Fetal Movement .....	6
Post Dates .....	6
Doppler Examination Specifically Requested by Referrer .....	7
Customised Grow Chart.....	7
<b>References .....</b>	<b>7</b>
<b>Contributors.....</b>	<b>7</b>
<b>Appendix 1: Summary Doppler Indications 2016 .....</b>	<b>8</b>
<b>Appendix 2: Summary Doppler Pathways Flowchart.....</b>	<b>10</b>

The aim of this guideline is to achieve a standardised approach to Doppler examinations performed in obstetric patients in the Christchurch region.

It is based on the New Zealand Obstetric Doppler Guideline, New Zealand Maternal Fetal Medicine Network 2014, slightly tailored to accommodate clinical practice specific to the Christchurch region.

Its primary focus is to recommend indications and pathways for Doppler assessment. Details in regards to Doppler technique, reference tables and reference graphs for Doppler values are not included in this document but can be found in the New Zealand Obstetric Doppler Guideline, New Zealand Maternal Fetal Medicine Network 2014.

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## DEFINITIONS

SGA	small for gestational age
IUGR	intrauterine growth restriction
AC	abdominal circumference
EFW	estimated fetal weight
GROW chart	customised fetal growth chart
IUD	intrauterine death
IDDM	insulin dependent diabetes
NIDDM	non-insulin dependent diabetes
IVF	in vitro fertilisation
PI	pulsatility index
UA	umbilical artery
MCA	middle cerebral artery
V max	peak systolic velocity
CPR	cereboplacental ratio
DV	ductus venosus
MoM	multiples of median
DCDA twins	dichorionic diamniotic twins
MCDA twins	monochorionic diamniotic twins
MCMA twins	monochorionic monoamniotic twins
TTTS	Twin Twin Transfusion Syndrome
TAPS	Twin Anaemia Polycythaemia Sequence

## SINGLETON PREGNANCIES

### UMBILICAL ARTERY DOPPLER (UA)

#### Use

- An indicator of placental function

#### Measurement

- Measured as Pulsatility Index (PI)
- > 95<sup>th</sup> percentile is abnormal
- Absent or reversed end diastolic flow is abnormal

#### Clinical indications

- Current SGA/IUGR
- Previous Intrauterine death (IUD) or stillbirth
- Previous IUGR
- Maternal hypertensive disorders (preeclampsia, pregnancy induced hypertension, essential hypertension)
- Maternal smoking or illicit drug use (including methadone program/Ngā Taonga Pēpi)
- Maternal diabetes (IDDM or NIDDM)
- Abnormal uterine artery Dopplers in the current pregnancy
- Abnormal UA, MCA or DV Doppler on a previous scan in the current pregnancy
- Significant antepartum haemorrhage (abruption)
- Decreased fetal movement

#### AND/OR

#### Ultrasound scan indications

- SGA/IUGR:
  - Abdominal circumference (AC) < 10th percentile and/or
  - Estimated fetal weight (EFW) < 10th percentile
- AC dropping centiles between 2 growth scans  $\geq 30\%$
- EFW dropping centiles between 2 growth scans  $\geq 30\%$
- Static or near static interval AC growth
- Oligohydramnios
- Hydrops

#### Doppler not indicated

The clinical indications outlined above are HIGH risk for SGA/IUGR and it is recommended Doppler assessment be performed in these patients.

Pregnancies with NO or LOW maternal or fetal risk factors with normal growth and normal amniotic fluid do not require Doppler assessment.

eg. gestational diabetes, low risk maternal medical disease such as Thyroid disease, Graves' disease, Crohn's disease, maternal fibroids, low risk fetal anomalies, IVF, low Papp A with normal uterine artery Dopplers

## Troubleshooting tips

- If PI is abnormal sample both umbilical arteries and use the more normal (lower) value
- Sample approximately mid umbilical cord (sampling too close to the fetal abdomen may produce a falsely elevated PI value)
- Perform Doppler at the start of the scan and if abnormal repeat at the end of the scan (allows time for an active baby to quieten down which may normalise the PI)

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## MIDDLE CEREBRAL ARTERY DOPPLER (MCA)

### Use

- An indicator of blood flow through the fetal brain
- Abnormal = 'fetal brain sparing'

### Measurement

- Measured as Pulsatility Index (PI).
- < 5<sup>th</sup> percentile is abnormal

### Indications

- SGA/IUGR on scan but normal UA PI Doppler in a fetus after 34 weeks' gestation
- Abnormal UA PI Doppler at any gestation

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## MCA PEAK SYSTOLIC VELOCITY (MCA V MAX)

### Use

- Detection of fetal anaemia

### Measurement

- cm/sec
- > 1.5 MoM is abnormal
- Angle correction is necessary

### Indications

- Maternal fetal isoimmunisation
- Any suspicion of fetal anaemia
- Unexplained hydrops
- MCDA twins with suspicion of TTTS or TAPS.

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## CEREBROPLACENTAL RATIO (CPR)

### Measurement

- Defined as the ratio of the Middle cerebral artery PI and the Umbilical artery PI
- < 5<sup>th</sup> percentile is abnormal

### Indications

- Should always be calculated if Umbilical artery PI and Middle Cerebral Artery PI are performed

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## DUCTUS VENOSUS DOPPLER (DV)

### Use

- Is an indicator of fetal cardiac function

### Measurement

- Either Pulsatility Index (PI) AND/OR A wave above or below the baseline
- PI > 95<sup>th</sup> percentile is abnormal
- A wave below baseline/reversed is abnormal

### Indications

- Raised UA PI AND low MCA PI in an SGA/IUGR baby

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## UTERINE ARTERY DOPPLER

### Use

- Screening for patients at high risk of early onset SGA or early preeclampsia

### Measurement

- Pulsatility Index (PI)
- PI is recorded as the Mean PI value between the two uterine artery Dopplers
- > 95<sup>th</sup> percentile is abnormal
- Bilateral notching after 24 weeks is abnormal

### Indications

- High risk for early onset SGA or early preeclampsia
- Known hypertensive disorder
- Low Papp A on first trimester screening.

### Timing

- Perform at 20 or 24 weeks' gestation
- If abnormal at 20 weeks repeat at 24 weeks

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## TWIN PREGNANCIES

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### DICHORIONIC DIAMNIOTIC TWINS

- Doppler assessment as per singleton pregnancy Doppler guideline above

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### MONOCHORIONIC TWINS (MCDA AND MCMA)

- If any suspicion of TTTS at any gestation from 16 weeks:  
UA PI + MCA PI + CPR + MCA (V max) + DV PI  
(report UA diastolic flow as present, absent or reversed between 16 and 21 weeks)  
(report UA PI from 21 weeks)

- If no suspicion of TTTS:
  - UA PI from 16 weeks  
(report UA diastolic flow as present, absent or reversed between 16 and 21 weeks)  
(report UA PI from 21 weeks)
  - add in MCA (V max) from 24 weeks

## DOPPLERS FOR SPECIFIC CLINICAL SITUATIONS

### HISTORY OF REDUCED FETAL MOVEMENT

- If the patient presents with a history of reduced fetal movement the sonographer should assess:
  1. growth
  2. amniotic fluid
  3. UA PI Doppler
  4. fetal movement (eg. Good movement, reduced movement etc)
  5. fetal cardiac activity
- If abnormal UA PI Doppler or if baby SGA on scan perform MCA Doppler + CPR

### POST DATES

- Defined as greater than 40 weeks' gestation

#### If Doppler examination is specifically requested

- Assess growth and amniotic fluid
- If BOTH growth and fluid are normal then Doppler assessment is not required. Report to state:

*"Normal Dopplers post-dates may be falsely reassuring. Clinical assessment is required."*

- If abnormal growth OR abnormal fluid perform Dopplers as per Doppler Indication Section above (page 3)
  - ie. perform UA PI if normal growth but oligohydramnios or other significant clinical risk
  - ie. perform UA PI + MCA PI + CPR if reduced interval growth  $\geq$  30% or SGA on scan

#### If Growth scan only is requested

- Assess growth and amniotic fluid.
- If BOTH growth and fluid are normal then Doppler assessment is not required
- If EITHER of these are abnormal perform as per Doppler Indication Section above (page 3)
  - ie. perform UA PI if normal growth but oligohydramnios or other significant clinical risk
  - ie. perform UA PI + MCA PI + CPR if reduced interval growth  $\geq$  30% or SGA on scan

## DOPPLER EXAMINATION SPECIFICALLY REQUESTED BY REFERRER

- If there are no clinical risk factors indicated or low clinical risk (see above)

AND

- NORMAL fetal growth (including interval growth) + NORMAL amniotic fluid then Doppler assessment is not required.
- The report should state:

*"As there are no clinical risk factors for SGA indicated and normal growth, Doppler assessment has not been performed as per New Zealand Obstetric Doppler Guideline NZMFMN 2014."*

## CUSTOMISED GROW CHART

- Reporting Radiologists in Christchurch do not currently have access to GROW charts which plots customised Estimated Fetal Weight (EFW) for each individual patient
- Until this can be resolved Radiology reports currently include a recommendation at the end:

*"Growth measurements in this report are plotted on population based growth charts. It is recommended that EFW be plotted on a customised GROW chart.*

*If the EFW is less than 10th percentile on GROW chart, recommend the patient return for Doppler assessment if this has not already been performed."*

## REFERENCES

1. NZ Maternal Fetal Medicine Network. New Zealand Obstetric Doppler Guideline. September 2014.
2. NZ Maternal Fetal Medicine Network. Guideline for the Management of Suspected SGA Singleton Pregnancies and Infants after 34 weeks' gestation. Revised November 2014.
3. NZ Maternal Fetal Medicine Network. Multiple Pregnancy Guideline. Updated September 2015.
4. RCOG. The Investigation and Management of the Small for Gestational Age Fetus. Greentop Guideline No. 31. 2nd Edition. Feb 2013.

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**APPENDIX 1: SUMMARY DOPPLER INDICATIONS 2016**

**UMBILICAL ARTERY DOPPLER INDICATIONS**

<b>CLINICAL INDICATION</b>	<b>and/or</b>	<b>SCAN INDICATION</b>
<ul style="list-style-type: none"> <li>• Current SGA/IUGR</li> <li>• Previous Intrauterine death (IUD) or stillbirth</li> <li>• Previous SGA/IUGR</li> <li>• Maternal hypertensive disorders (preeclampsia/PET, pregnancy induced hypertension/PIH, essential hypertension/increased bp)</li> <li>• Maternal smoking or illicit drug use (incl. methadone program/Ngā Taonga Pēpi)</li> <li>• Maternal diabetes (IDDM or NIDDM)</li> <li>• Abnormal uterine artery Dopplers in the current pregnancy</li> <li>• Abnormal UA, MCA or DV Dopplers in the current pregnancy</li> <li>• Significant APH (possible abruption)</li> <li>• Decreased fetal movement</li> </ul>		<ul style="list-style-type: none"> <li>• SGA/IUGR:               <ul style="list-style-type: none"> <li>- AC &lt; 10th percentile</li> <li>and/or</li> <li>- EFW &lt; 10th percentile</li> </ul> </li> <li>• AC dropping centiles between 2 growth scans by &gt; = 30 %</li> <li>• EFW dropping centiles between 2 growth scans by &gt; = 30%</li> <li>• Static or near static interval growth</li> <li>• Oligohydramnios</li> <li>• Hydrops</li> </ul>

**MIDDLE CEREBRAL ARTERY DOPPLER INDICATIONS**

- SGA/IUGR on scan but normal UA Doppler after 34 weeks' gestation
- Abnormal UA at any gestation

**CEREBROPLACENTAL RATIO**

- Calculate when both UA and MCA Dopplers are performed

**DUCTUS VENOSUS DOPPLER INDICATION**

- Abnormal UA Doppler AND abnormal MCA Doppler in an SGA/IUGR baby.

**MCA PEAK SYSTOLIC VELOCITY (MCA V MAX)**

- Maternal fetal isoimmunisation
- Any suspicion of fetal anaemia
- Unexplained hydrops
- MCDA twins with suspicion of TTTS or TAPS

**DCDA TWINS**

- As per singleton Dopplers above



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## MONOCHORIONIC TWINS

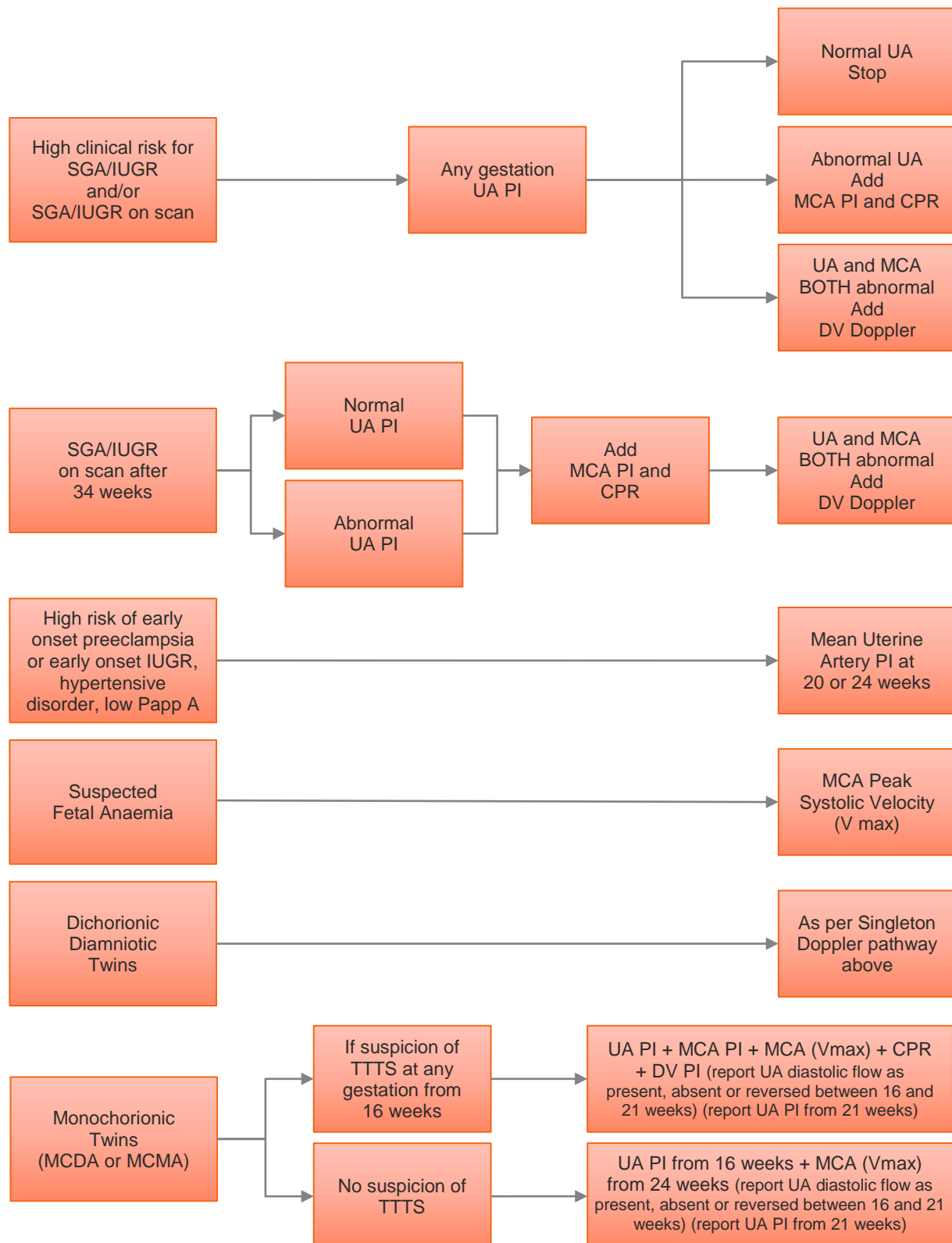
- If any suspicion of TTTS at any gestation from 16 weeks:  
UA PI + MCA PI + CPR + MCA (V max) + DV PI  
(report UA diastolic flow as present, absent or reversed between 16 and 21 weeks)  
(report UA PI from 21 weeks)
- If no suspicion of TTTS:  
UA PI from 16 weeks  
(report UA diastolic flow as present, absent or reversed between 16 and 21 weeks)  
(report UA PI from 21 weeks)  
add in MCA (V max) from 24 weeks

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## MEAN UTERINE ARTERY DOPPLER

- Screening for patients at high risk of early onset preeclampsia or early onset SGA at 20 or 24 weeks
- Hypertensive disorder
- Low Papp A on first trimester screening

## APPENDIX 2: SUMMARY DOPPLER PATHWAYS FLOWCHART



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Antenatal Obstetric Ultrasound: Indications for Doppler Assessment

Maternity Guidelines

Christchurch Women's Hospital

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