

**OXCOG**

**OXCOG.CO.UK**

---

# Fetal Growth Restriction, MCDA Twins & Higher Order Multiple Pregnancy

MRCOG Part 2 Online Revision Course

Miss Kit Robertson – Consultant in Obstetrics and  
Maternal-Fetal Medicine, Oxford University Hospitals

# Aims & Objectives

- Cover MRCOG syllabus requirements for:
  - Fetal Growth Restriction
  - Monochorionic Diamniotic (MCDA) Twins
  - Higher order multiple pregnancies
  - Preterm birth prevention in multiple pregnancies

# Fetal Growth Restriction

## The Investigation and Management of the Small-for-Gestational-Age Fetus

Green-top Guideline No. 31

2nd Edition | February 2013 | Minor revisions – January 2014

- GTG last updated in 2014...
- Things to memorize from this GTG: risk factors for SGA, types of fetal Doppler studies and their indications at different gestations
- Controversies: timing of delivery (GTG vs SBLV3)
- General rule of thumb: go with most recent updated advice i.e. SBLV3

### Saving Babies' Lives Version Three

A care bundle for reducing perinatal mortality

Version 3.1, July 2023



Potential  
SBA/EMQ

# Definitions

## Small for Gestational Age (SGA)

- EFW or AC < 10<sup>th</sup> centile
- By definition 10% prevalence

## Severe SGA

- EFW or AC < 3<sup>rd</sup> centile

## Fetal Growth Restriction

- Early onset
- Late onset

# SGA / Fetal Growth Restriction - Aetiology

- **Small – Normal**

- Up to 50-70% of SGA babies are constitutionally small

- **Small – Abnormal (usually EFW <3<sup>rd</sup>)**

- Infection – 2% CMV, Toxo is rare
- No structural abnormalities:
  - 1.6% chromosomal abnormality, 0.6% have abnormal micro-array result
- Associated structural abnormalities:
  - 5.8% chromosomal abnormality, 1.9% have abnormal micro-array results

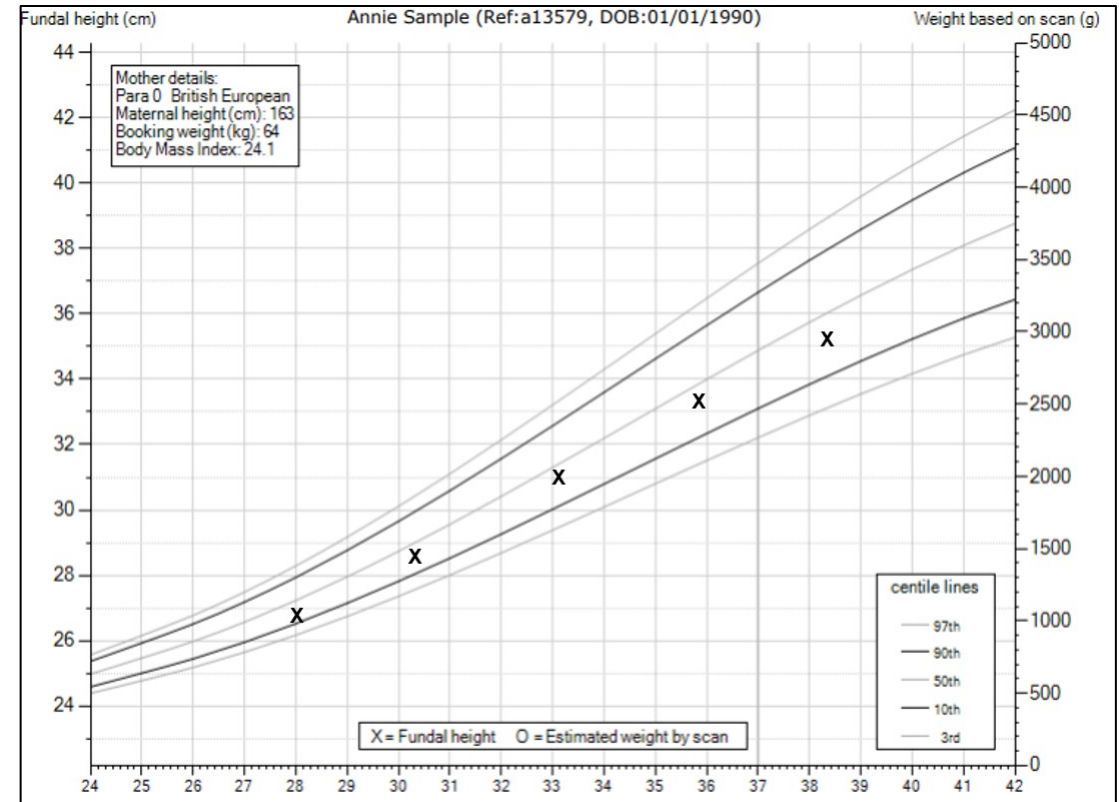
## **Small – Placental insufficiency**

- 10-15% overall, but up to 50% of late onset fetal growth restriction with abnormal cerebro-placental ratio (CPR)
- EFW may not be <10<sup>th</sup> but is usually <20<sup>th</sup> centil

# Fetal Growth Restriction

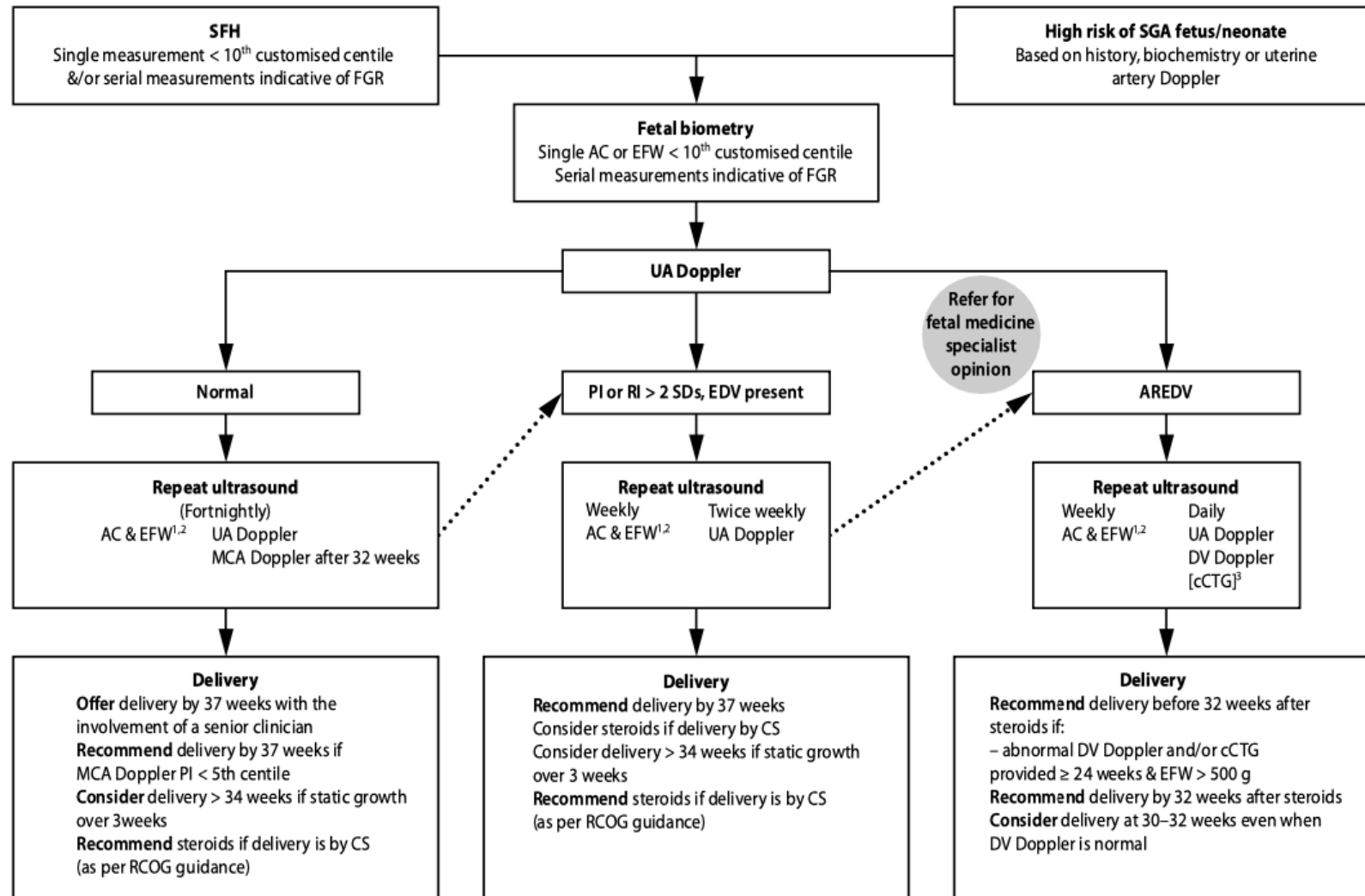
## - Diagnosis

- Fetal abdominal circumference (AC) or estimated fetal weight (EFW) < 10th centile can be used to diagnose a SGA fetus.
- Customised fetal weight reference – e.g. GAP GROW chart
- Currently routine third trimester scan not recommended for all
- Reduced growth velocity - Change in AC or EFW with  $\geq 3$  week interscan interval
  - GTG doesn't specify this
  - Current literature: ACGV drop of >40 percentile points (unlikely to be asked this in exam)



# Fetal Growth Restriction - Monitoring

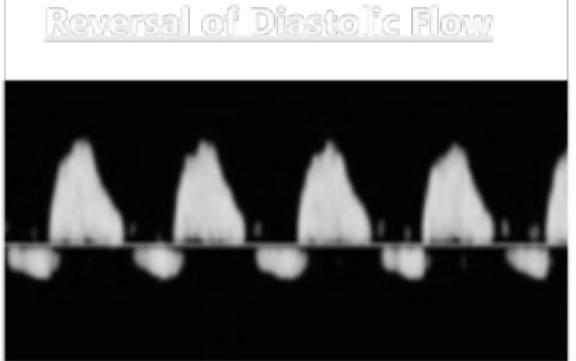
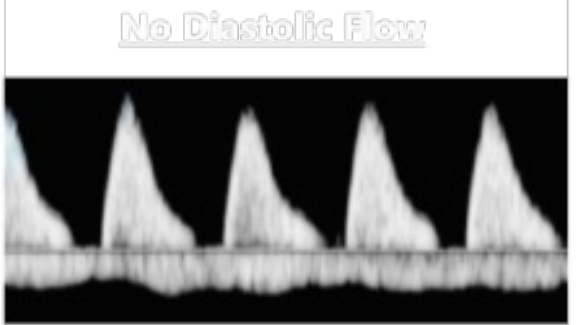
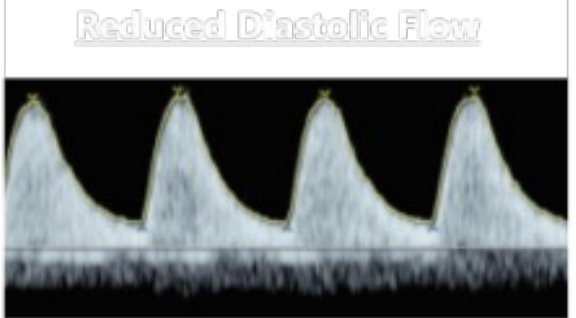
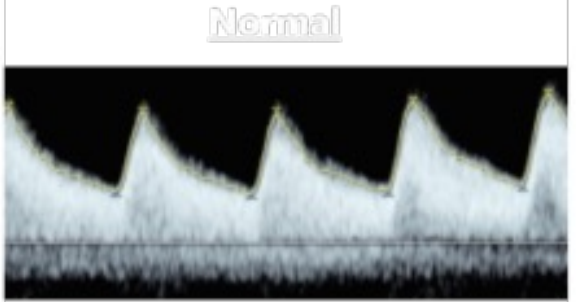
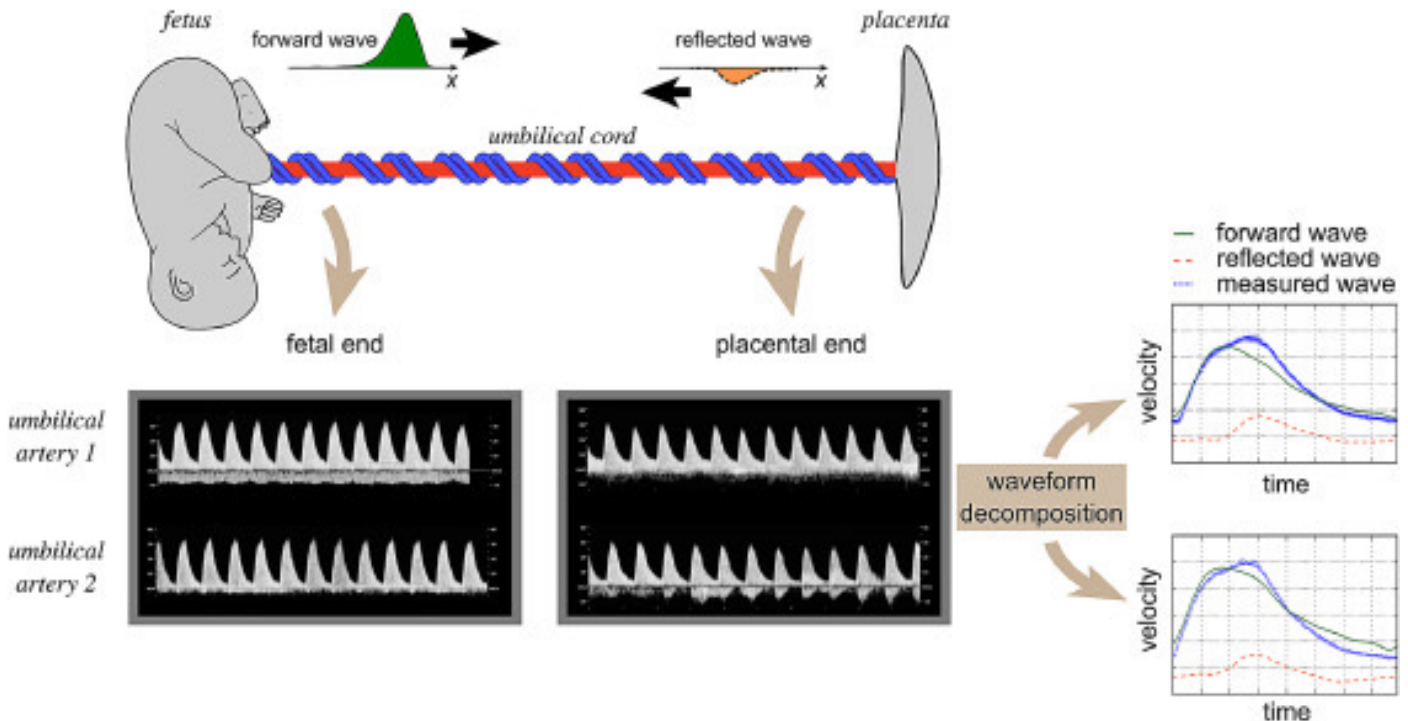
## APPENDIX III: The Management of the Small-for-Gestational-Age (SGA) Fetus



Potential  
SBA/EMQ

# Fetal Growth Restriction - Monitoring

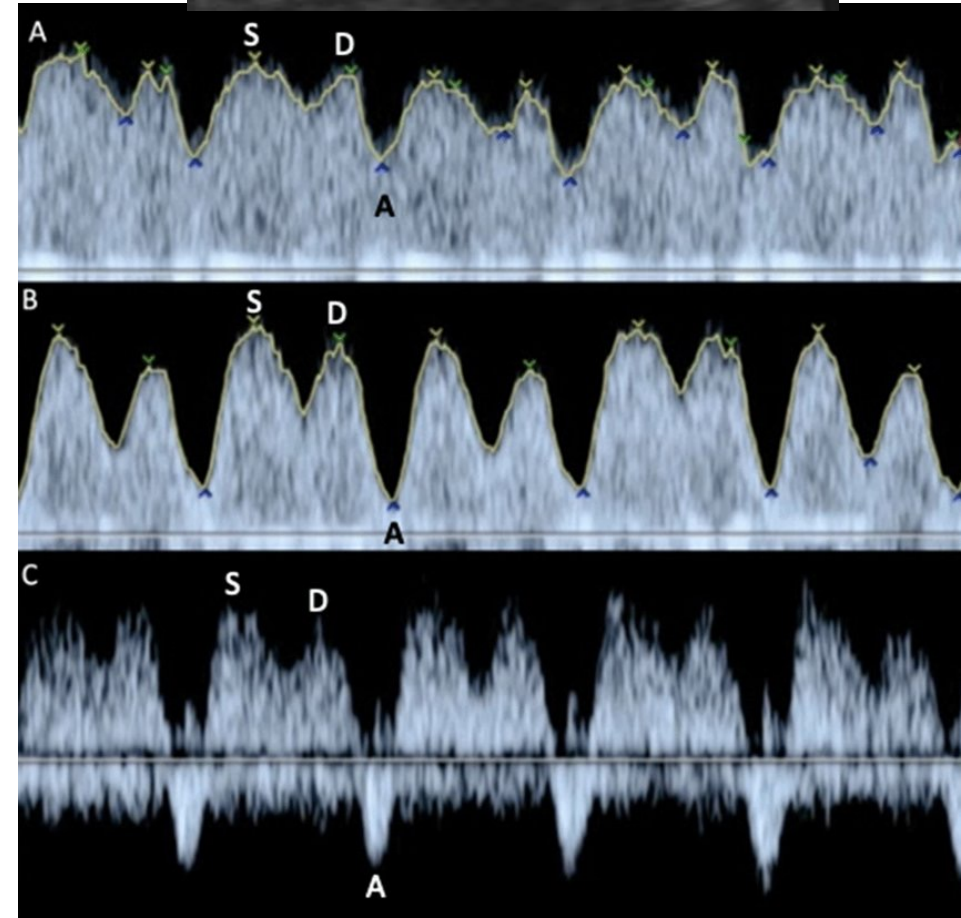
- Before 32 weeks, monitor with umbilical artery Doppler PI
- “Free loop” of umbilical cord
- Positive end diastolic flow (EDF) – further growth is likely
- Absent or reversed EDF – further growth unlikely





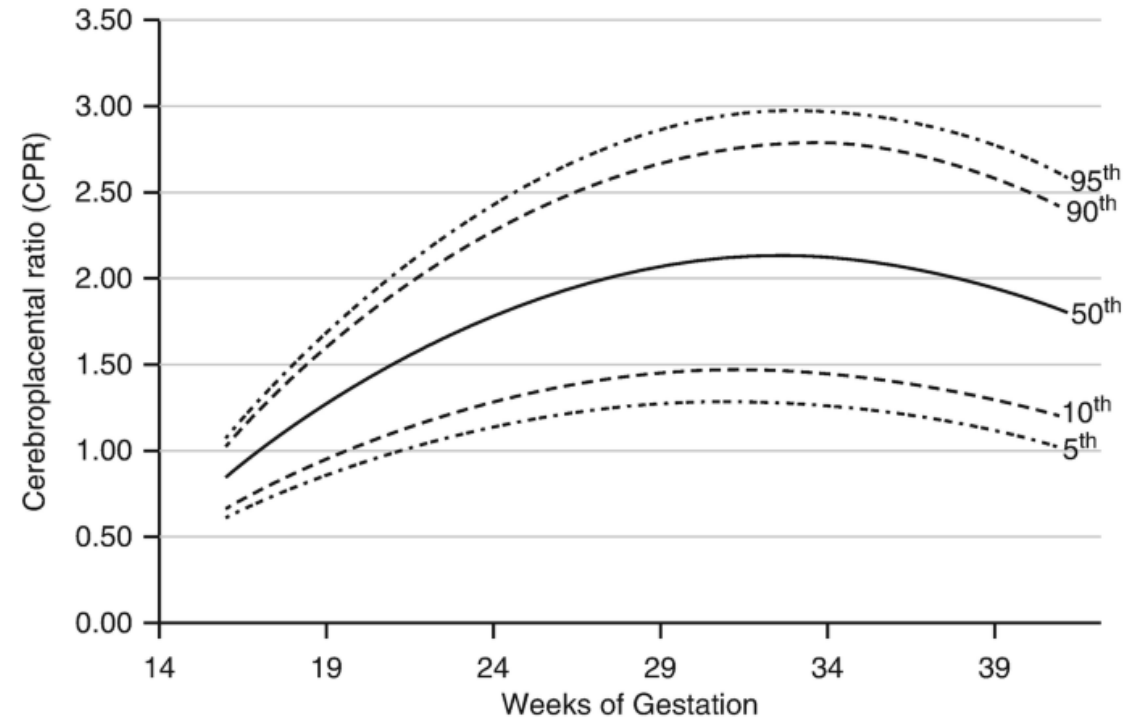
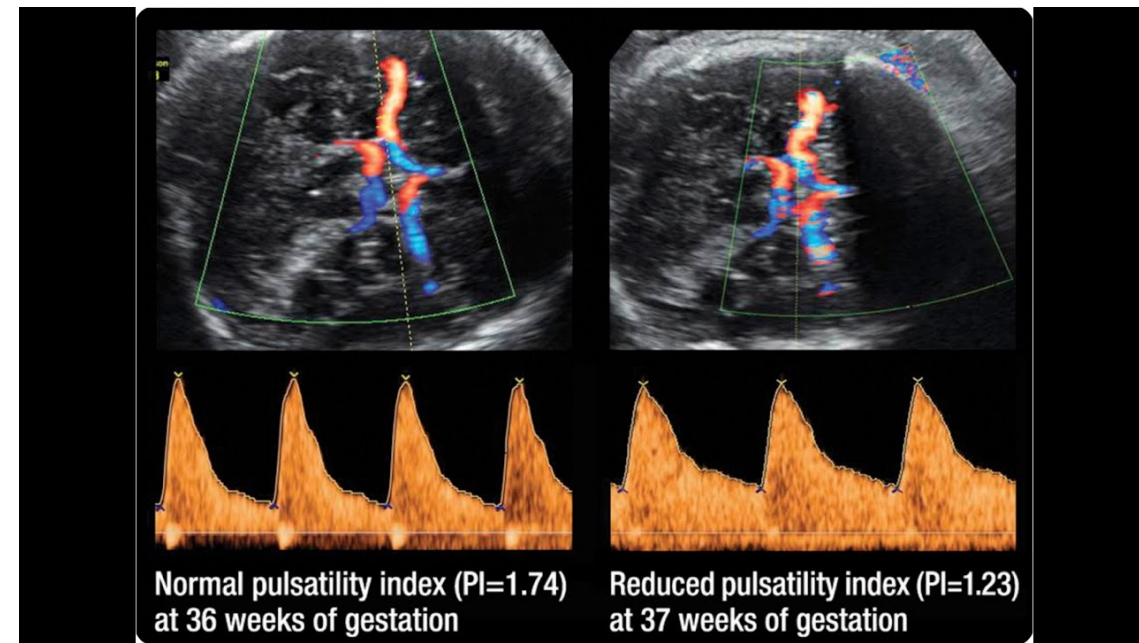
# Fetal Growth Restriction - Monitoring

- If absent end diastolic flow (AEDF), monitoring by EITHER ductus venosus (DV) Doppler up to 32 weeks or computerized CTG (cCTG)
- Delivery is indicated if reversed DV a-wave or cCTG with STV<3 (based on TRUFFLE study)
- Once DV reverses or STV<3, high risk of fetal death within 24 hours



# Middle Cerebral Artery (MCA) Dopplers and Cerebroplacental Ratio (CPR)

- MCA useful after 35 weeks to calculate CPR
- CPR is NOT useful before 34 weeks to time delivery
- Pragmatically:  $CPR < 1.0$  is abnormal
- Well established evidence base for SGA / FGR fetus
- Uncertain role in normally grown babies but probably useful to detect the undetected late onset FGR fetus (\*not going to get asked this in exam)



# Fetal Growth Restriction - Delivery

- GTG: All SGA should be delivered by 37 weeks...
- SBLV3: early term delivery reduces the risk of IUD / NND (rare) but increases NICU admission and increasing extended perinatal mortality
  - 10 inductions at 37 weeks will lead to one additional baby being admitted for neonatal care
  - 700 inductions to prevent each perinatal death

**Figure 3:** Neonatal unit admission according to week of gestational age, comparing induction of labour versus expectant management<sup>9</sup>

• Week of gestational age	• Neonatal admission per 1,000		• Adjusted odds ratio (95% CI)
	• Induction of labour	• Delivered later	
• 37	• 176	• 78	• 2.01 (1.80-2.25)
• 38	• 113	• 74	• 1.53 (1.41-1.67)
• 39	• 93	• 73	• 1.17 (1.07-1.20)
• 40	• 80	• 73	• 1.14 (1.09-1.20)
• 41	• 66	• 84	• 0.99 (0.93-1.05)

**Figure 4:** Extended perinatal mortality according to week of gestational age, comparing induction of labour versus expectant management<sup>9</sup>.

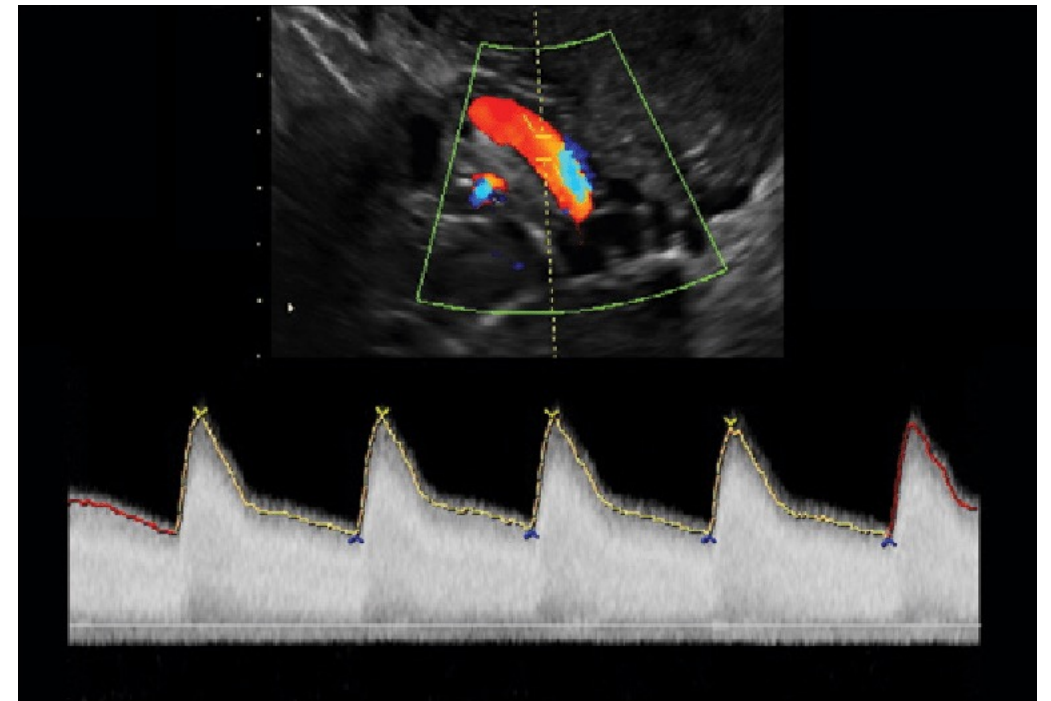
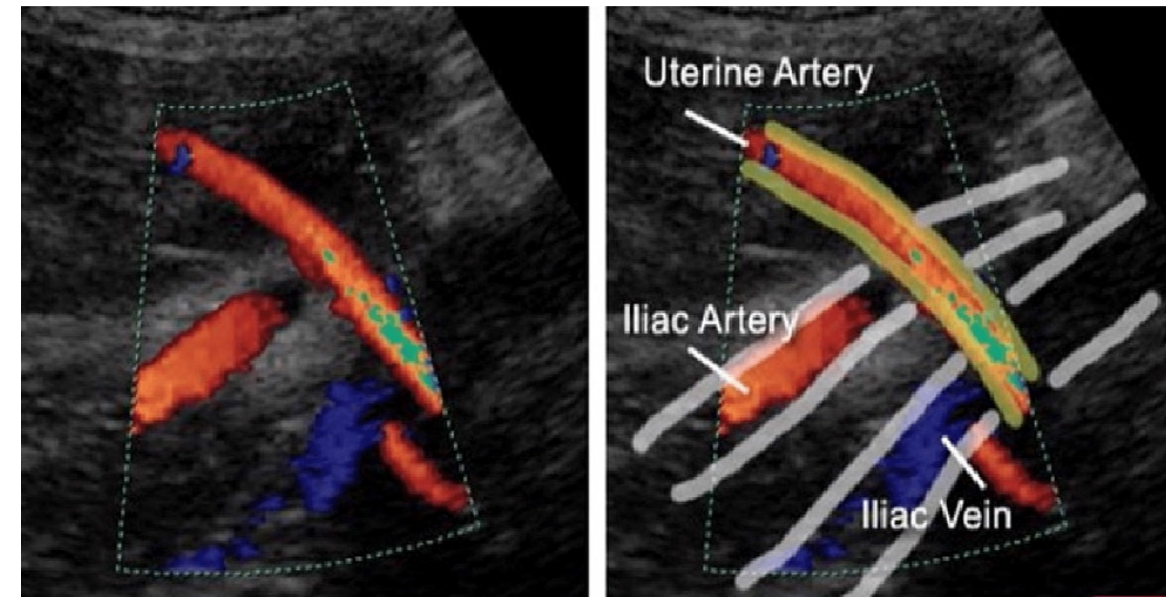
• Week of gestational age	• Extended perinatal mortality per 1,000		• Adjusted odds ratio (95% CI)
	• Induction of labour	• Delivered later	
• 37	• 0.9	• 2.3	• 0.15 (0.03-0.68)
• 38	• 0.8	• 2.0	• 0.23 (0.09-0.58)
• 39	• 0.6	• 1.9	• 0.26 (0.11-0.62)
• 40	• 0.8	• 1.8	• 0.39 (0.24-0.63)
• 41	• 0.7	• 2.2	• 0.31 (0.19-0.49)

# SBVL3

- EFW <3<sup>rd</sup> centile and no other risk factors – delivery 37+0 to 37+6 weeks
- EFW >3<sup>rd</sup> but <10<sup>th</sup> and no other risk factors – delivery 39+0 to 39+6 weeks
- EFW <3<sup>rd</sup> centile and and other risk factors e.g. *RFMs, hypertensive Dx, oligohydramnios, abnormal Dopplers, abnormal sFLT:PLGF ratio* – individualise (Translation: earlier)
- EFW >3<sup>rd</sup> but <10<sup>th</sup> and other risk factors – individualise (Translation: earlier)
- Reduced growth velocity (any EFW) and no other risk factors – deliver 37+0 weeks

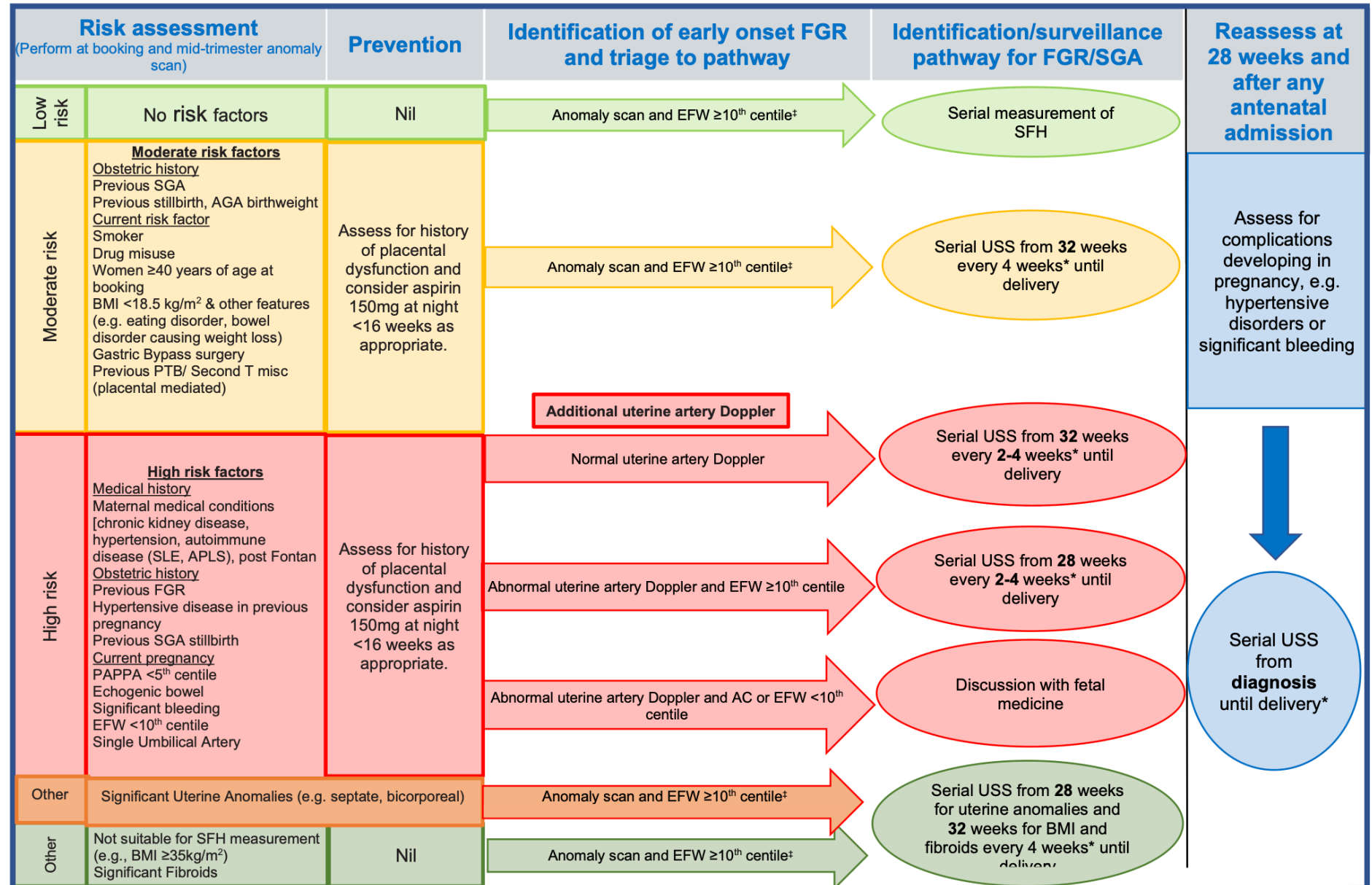
# Uterine Artery Dopplers

- Excellent screening tool for placental insufficiency: 18-22 weeks
- GTG and SBLV3: recommend use for screening in high risk populations
- Not currently recommended for low or moderate risk populations (but this may change..)
- Combined UtAD PI of  $\geq 2.5$  is abnormal ( $>95^{\text{th}}$  centile)
- Very raised UtAD PI  $\geq 3.5$  – MUCH higher risk



# Fetal Growth Restriction - Screening

**Figure 6:** Algorithm for using uterine artery Doppler as a screening tool for risk of early onset FGR.



The risk factors listed here constitute those routinely assessed at booking, other risk factors exist and risk assessment must always be individualised taking into account previous medical and obstetric history and current pregnancy history. For women with maternal medical conditions and individuals with disease progression or institution of medical therapies may increase an individual's risk and necessitate monitoring with serial scanning. For women with a previous stillbirth, management must be tailored to the previous history i.e. evidence of placental dysfunction or maternal medical conditions. Serial measurement should be performed as per NICE antenatal care guideline.

# Example EMQs

- Anomaly: EFW and AC <3<sup>rd</sup> centile, abnormal uterines
- Anomaly: EFW and AC <3<sup>rd</sup> centile, normal uterines
- Anomaly: EFW 50<sup>th</sup> centile, abnormal uterines
- Anomaly: EFW 50<sup>th</sup> centile, normal uterines
- 28 weeks: EFW <3<sup>rd</sup> centile, normal umbAD
- 28 weeks: EFW <3<sup>rd</sup> centile, abnormal umbAD
- 36 week scan: EFW <3<sup>rd</sup> centile, normal umbAD
- 36 week scan: EFW <3<sup>rd</sup> centile, abnormal umbAD
- 36 week scan: EFW 9<sup>th</sup> centile, normal umbAD
- 36 week scan: EFW 9<sup>th</sup> centile, abnormal umbAD

	Answer Option
A	Growth scan in 1 week
B	Growth scan in 2 weeks
C	Growth scan in 4 weeks
D	Umbilical artery Doppler in 3-4 days
E	Umbilical artery Doppler in 1 week
F	Umbilical artery Doppler in 2 weeks
G	Umbilical artery Doppler in 4 weeks
H	Ductus Venosus Doppler
I	cCTG
J	Middle Cerebral Artery Doppler
K	Cerebroplacental ratio
L	Repeat uterine artery Dopplers at 28 weeks
M	Repeat uterine artery Dopplers at 28 weeks

# Monochorionic Twins

- GTG and NICE guidelines
- Things to memorise: stages of TTTS and types of sIUGR
- Differentiate MRCOG vs subspecialist level of knowledge
  
- Pragmatic approach clinically: MCDA – expect the unexpected..

## Management of Monochorionic Twin Pregnancy

Green-top Guideline No. 51  
November 2016

### Twin and triplet pregnancy

NICE guideline  
Published: 4 September 2019  
[www.nice.org.uk/guidance/ng137](http://www.nice.org.uk/guidance/ng137)



# Twin to Twin Transfusion Syndrome (TTTS)

- **Prevalence:** 10-15% of monochorionic twins.
- **Ultrasound diagnosis:**
- There is imbalance in the net flow of blood across the placental vascular communications from one fetus, the donor, to the other, the recipient.
  - 11-14 weeks: early TTTS is suspected if there is discordance in size of the amniotic fluid sacs,  $\geq 20\%$  discordance in fetal nuchal translucency (NT) thickness, or absent / reversed end diastolic flow (EDF) in the ductus venosus usually in the fetus with higher NT.
  - $\geq 15$  weeks: **oligohydramnios** (deepest vertical pool of  $\leq 2$  cm) in the sac of the oliguric or anuric donor fetus and **polyhydramnios** ( $\geq 6$  cm at 15-17 weeks,  $\geq 8$  cm at 18-20 weeks and  $> 10$  cm at  $\geq 20$  weeks) in the sac of the polyuric recipient.

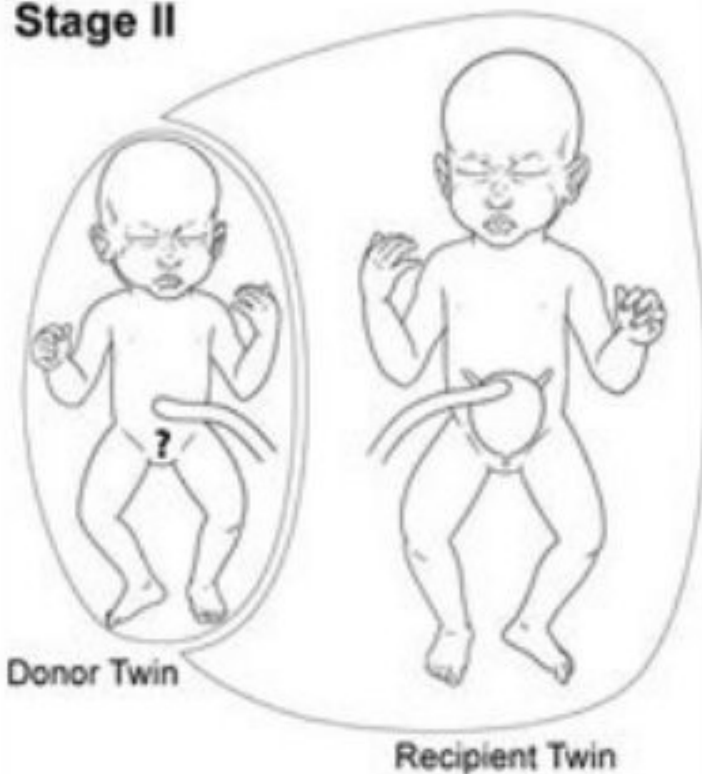
# Staging of TTTS

- ***\*\*Liquor – Bladder – Dopplers (umbAD / MCA PSV / DV) \*\****
- The condition is subdivided into 4 stages according to the Doppler finding of EDF in the umbilical artery and ductus venosus of both fetuses:
  - **Stage 1:** donor bladder visible, EDF positive in both vessels in both fetuses.
  - **Stage 2:** donor bladder not visible, EDF positive in both vessels in both fetuses.
  - **Stage 3:** EDF absent or reversed in either vessel in either fetus.
  - **Stage 4:** presence of ascites or hydrops in either fetus; usually the recipient.

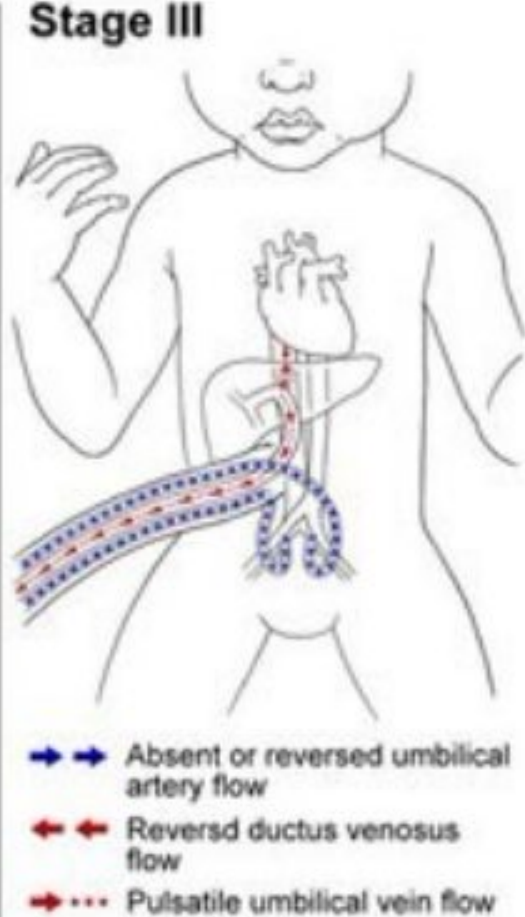
### Stage I



### Stage II



### Stage III



### Stage IV



Imbalanced distribution of amniotic fluid with the donor twin sharing less than the recipient.

Similar to stage I, but the bladder of the donor twin is not visible with doppler.

One or both twins presents with fetal hydrops.

# Management of TTTS

- **Discordance in amniotic fluid** (but not sufficient to fulfill the oligohydramnios / polyhydramnios sequence) with normal fetal Doppler:
  - Overall survival: 95%.
  - Progression to TTTS: 15%.
  - Ultrasound scans every 1-2 weeks to monitor evolution.
- **Stage 1:**
  - Survival: overall 85%, at least one twin 90%.
  - Progression to stages 2 to 4: 20%.
  - Ultrasound scans every 1 week to monitor evolution.
  - Endoscopic laser ablation of communicating placental vessels if progression to stages 2-4 or increasing polyhydramnios and shortening of cervical length.

# Management of TTTS

- **Stages 2-4:**
- <28 weeks: the best management is endoscopic laser ablation of communicating placental vessels; all communicating vessels should be ablated and the area between them should also be coagulated to achieve dichorionization of the placenta.
- $\geq$ 28 weeks: the best option is to deliver by cesarean section and the timing would depend on the Doppler findings in the umbilical artery and ductus venosus of both fetuses.

# Management of TTTS

- **Stage 2:** survival overall 75%, at least one twin 85%.
- **Stages 3 and 4:** survival overall 60-70%, at least one twin 75-85%.
- Neurodevelopmental impairment in survivors: 5-10%.
- Follow-up after laser therapy: ultrasound scans and Doppler every 1 week until resolution of the signs of TTTS and normalization of Doppler findings and every 2 weeks thereafter with special attention for signs of brain damage, recurrence of TTTS and development of TAPS.
- Normalization of amniotic fluid volume occurs after 1 week. Resolution of cardiac dysfunction in the recipient and of hydrops in stage 4 TTTS usually occurs after 3-4 weeks.

## Laser for twin-to-twin transfusion syndrome: a guide for endoscopic surgeons

[L Van Der Veecken](#), [I Couck](#), [J Van Der Merwe](#), [L De Catte](#), [R Devlieger](#), [J Depreest](#), and [L Lewi](#)

Figure 1

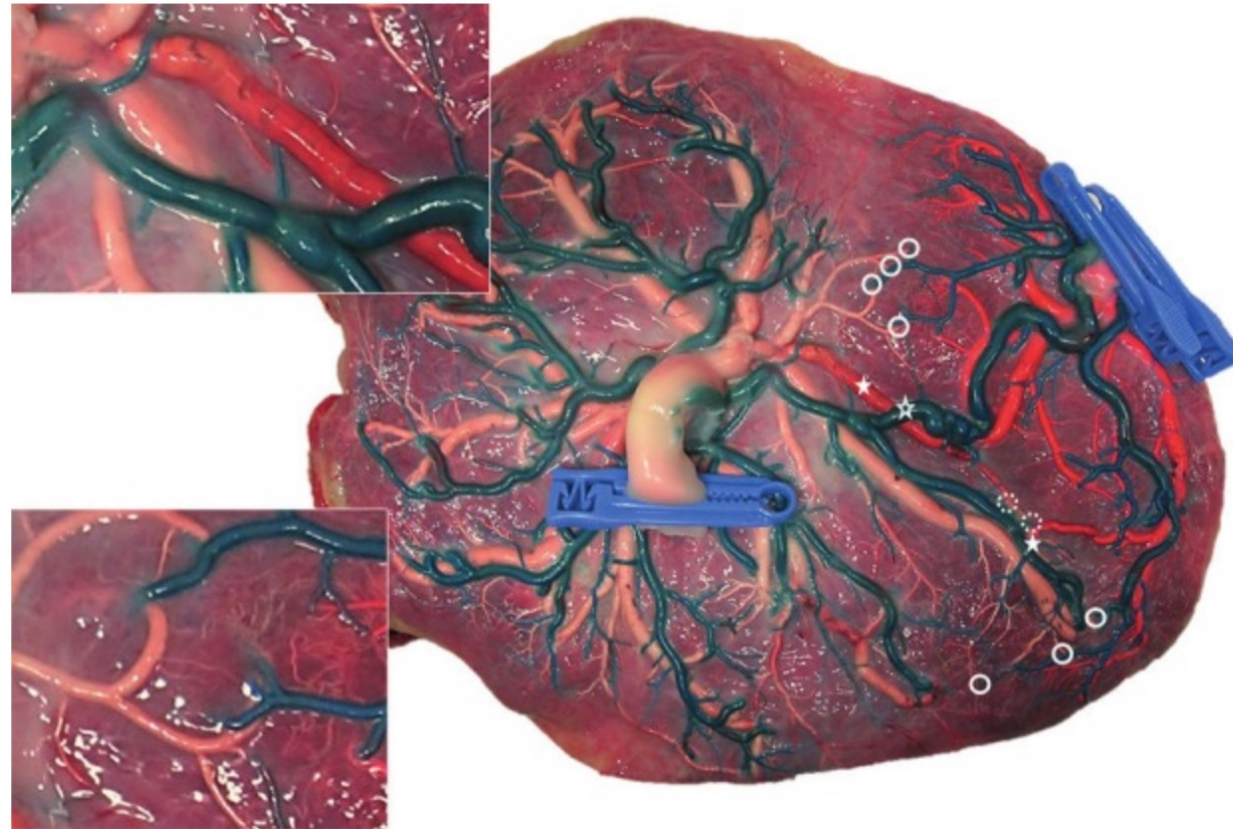
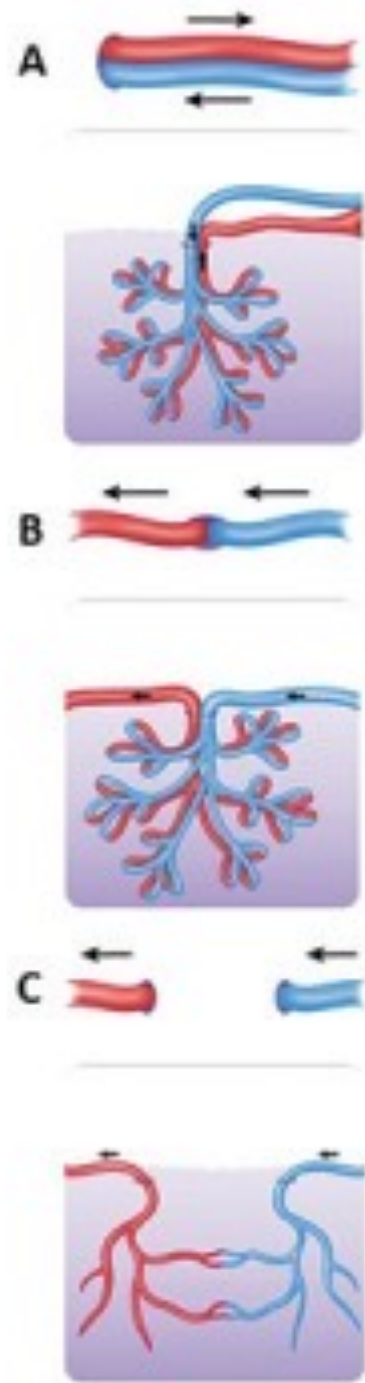
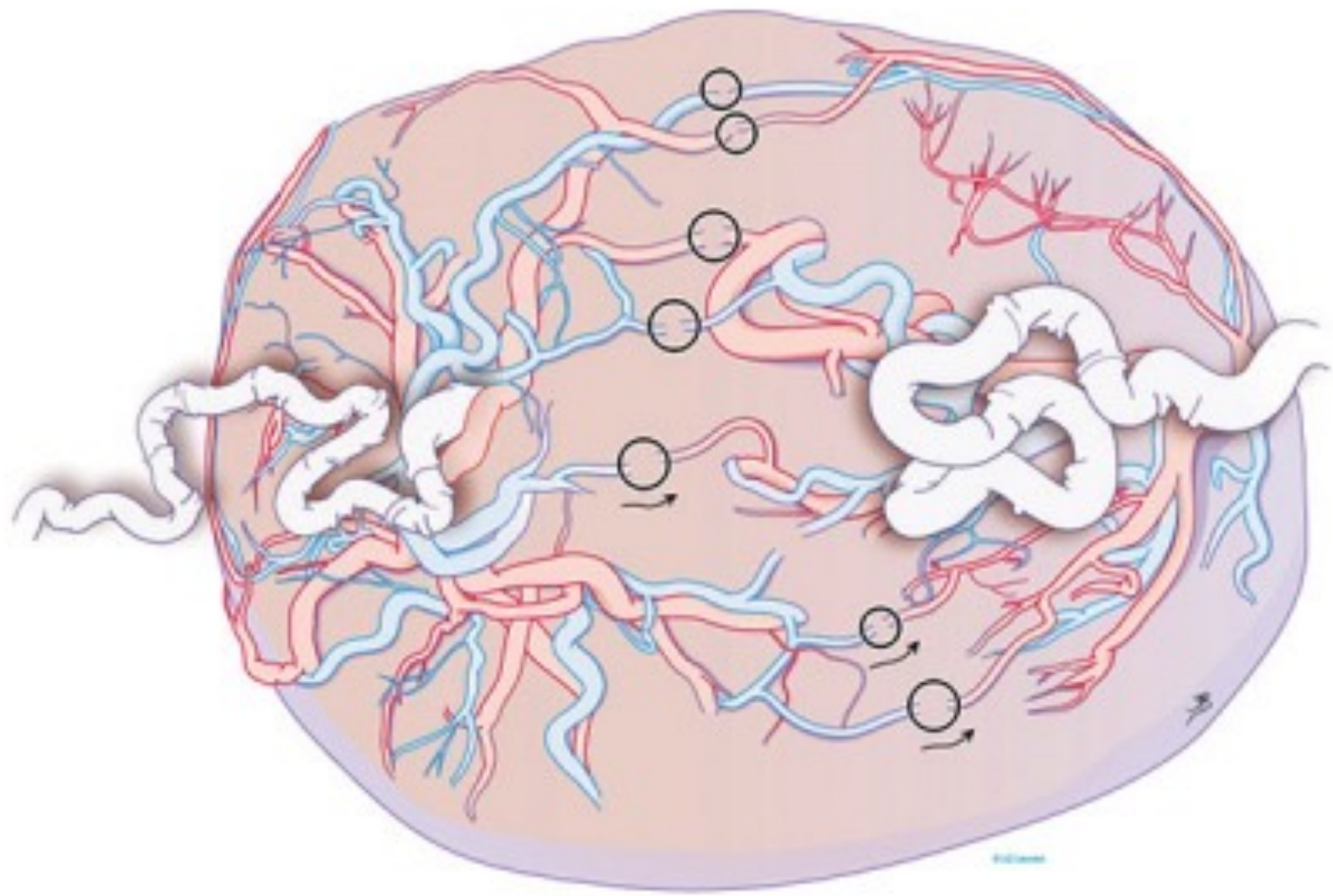
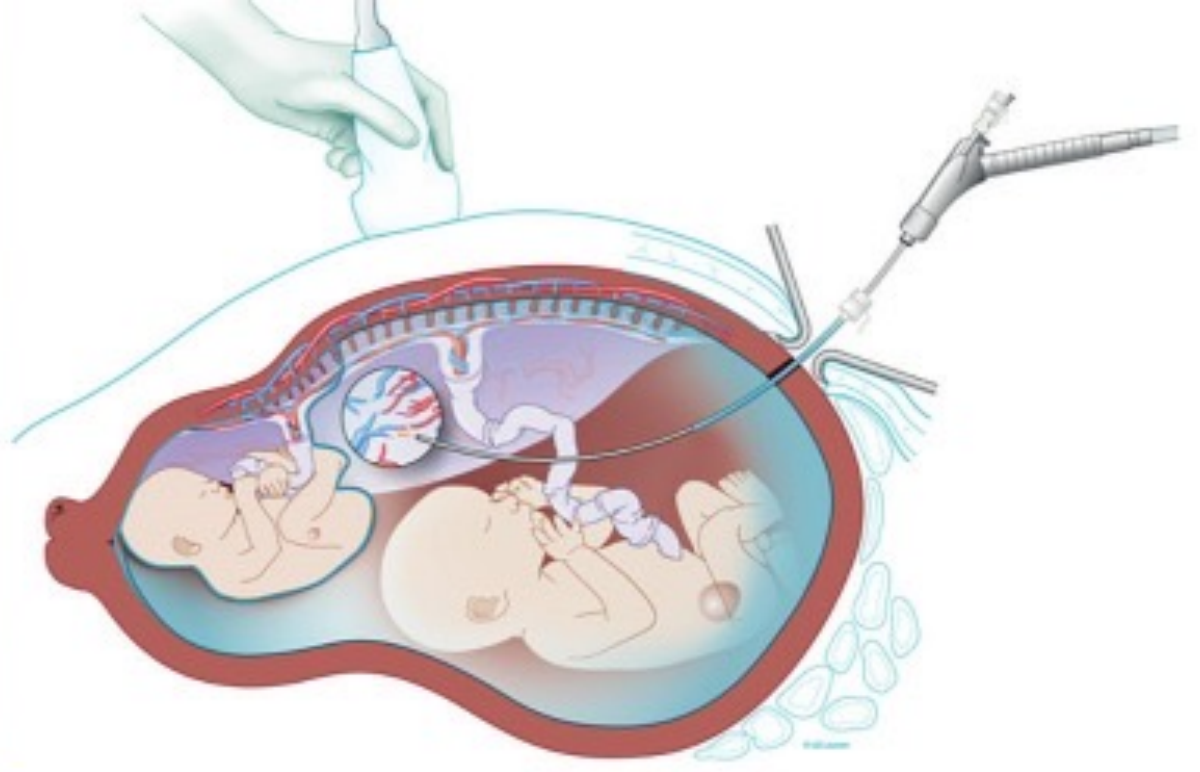


Image from a placenta of a monochorionic pregnancy. Multiple anastomoses are present: 1AA (open star) ; 2 VV (full star) ; multiple AV (dotted circle) ; multiple VA (full circle). Reproduced with permission and copyright: UZ Leuven, Belgium.





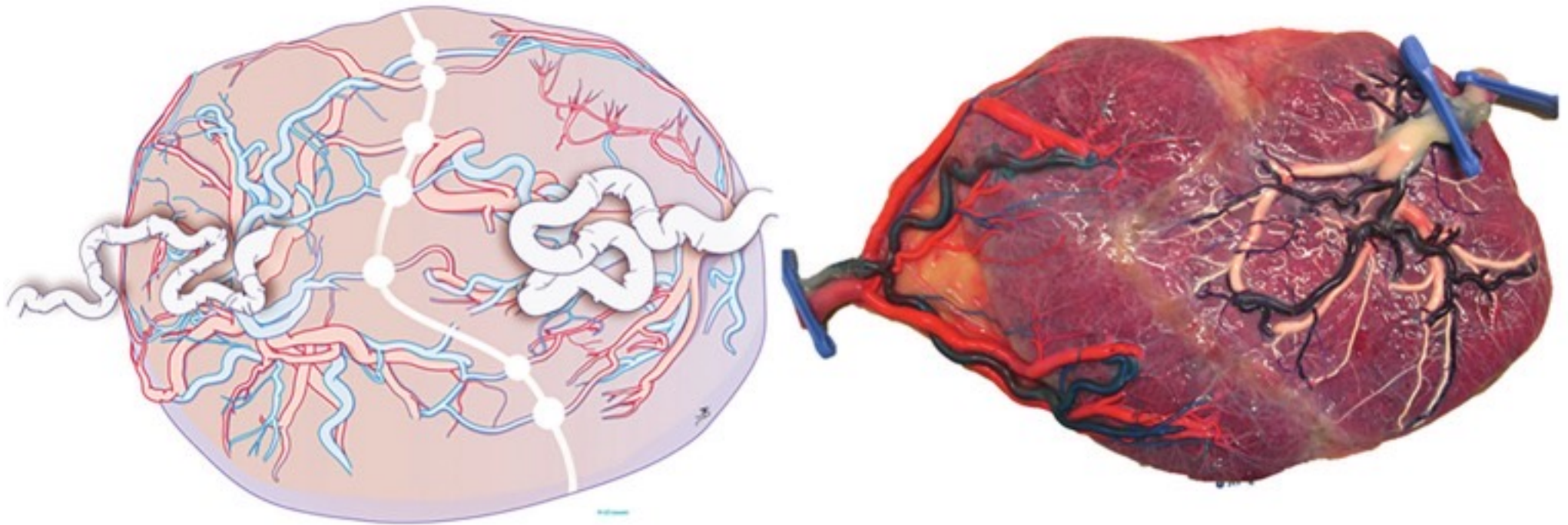




# Landmarks during Laser



# Solomon technique



# Short term fetal outcomes

- The most important early complication is in utero fetal demise of one or both twins (45% and 12% respectively)
- Early procedures (<17 weeks) have poorer outcomes than later ones, mainly by higher PPRM rates
- TAPS is caused by missed small anastomoses, up to 3% after dichorionization
- More uncommon is persisting or recurrent TTTS , which occurs in about 1%, e.g. due to technical difficulties with missed large anastomoses.
- Management will depend on gestational age and technical aspects. A second laser is possible but can be complicated by hemorrhagic amniotic fluid caused by the previous intervention.

# Short term maternal outcomes

- Immediate postoperative maternal complications include peritoneal irritation due to amniotic fluid leakage and/or blood in the abdominal cavity
- Although rare, hemorrhage, infection and placental abruption have been described
- The clinically most relevant postoperative problems are preterm labor and delivery and membrane rupture
- Iatrogenic PPRM is described in 27% of cases, potentially higher when using the Solomon technique

# Long term fetal outcomes

- Level I evidence that primary laser coagulation improves survival of both twins from 35 to 65% and survival of at least one twin from 70 to 88%
- In a recent systematic review, the long term neurodevelopmental impairment was 10% after laser
- For stage I the optimal management remains controversial
- There is currently an ongoing trial comparing immediate laser coagulation with expectant management followed by laser coagulation if necessary
- No significant long term maternal complications

# Selective Growth Restriction in MCDA Twins

- **Prevalence:**

- 10-15% of monochorionic twins

- **Ultrasound diagnosis:**

- Estimated weight <5th percentile in the small fetus and  $\geq 25\%$  discordance between the two fetuses
- The amniotic fluid in the small fetus is reduced and in the other fetus is normal.



# Selective Growth Restriction in MCDA Twins

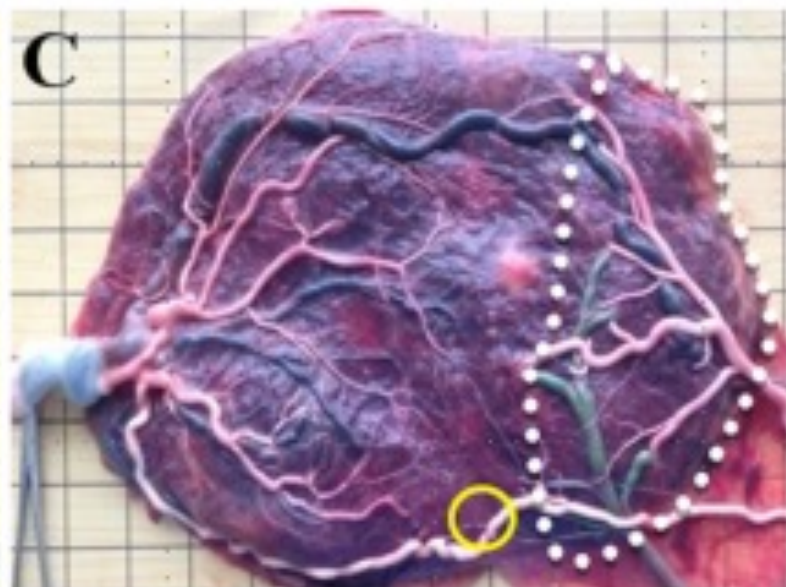
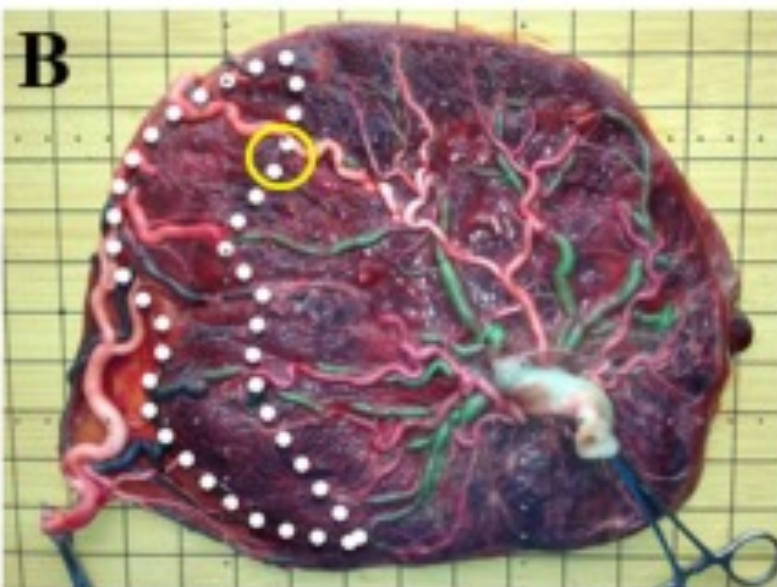
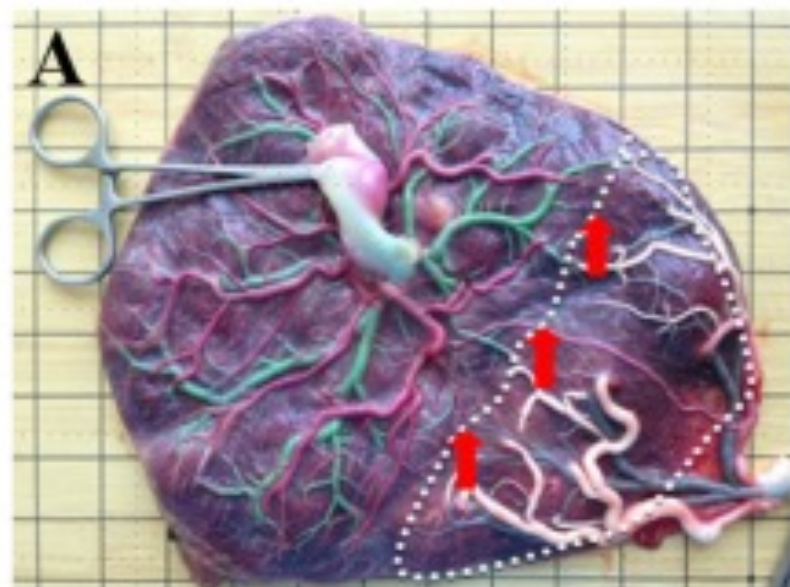
- The condition is subdivided into 3 types according to the Doppler finding of the end diastolic flow (EDF) in the umbilical artery of the small fetus:
  - **Type I:** EDF positive.
  - **Type II:** EDF absent or reversed
  - **Type III:** EDF cyclical change from positive to absent and reversed.
- If in the presence of  $\geq 25\%$  estimated weight discordance between the fetuses there is polyhydramnios in the sac of the bigger twin the condition is sFGR with superimposed TTTS.
- **Associated abnormalities:**
  - The incidence of chromosomal abnormalities or genetic syndromes is not increased.

Type 1 sIUGR

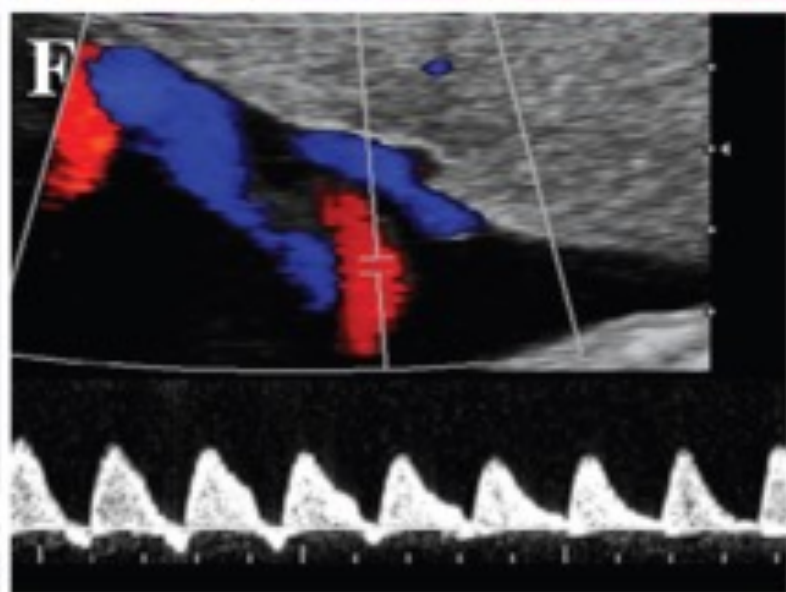
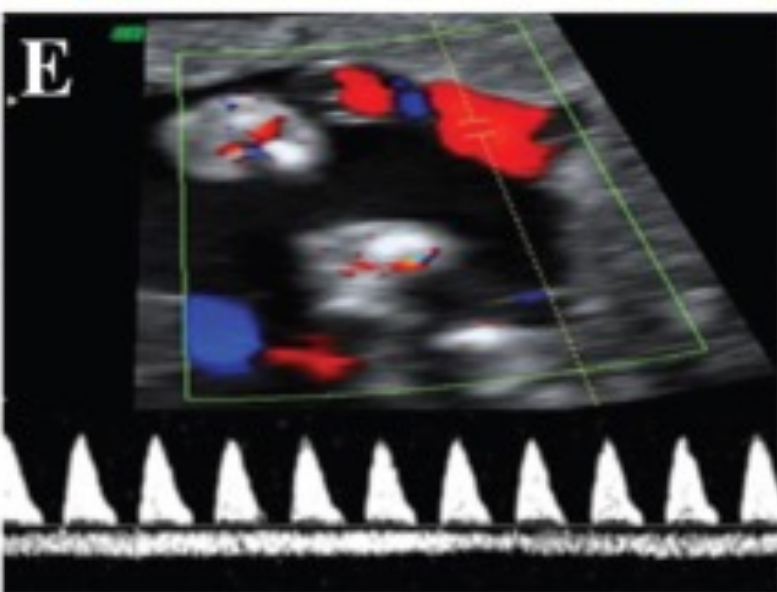
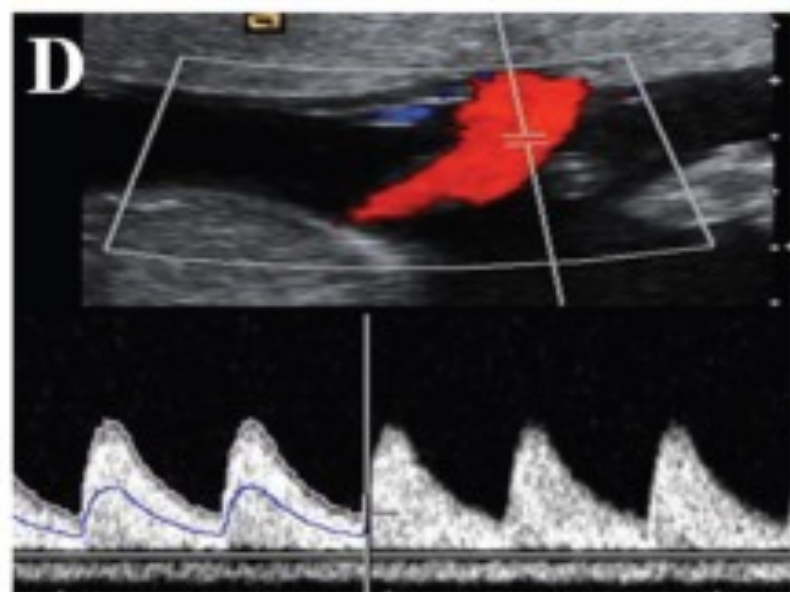
Type 2 sIUGR

Type 3 sIUGR

Placentae



Umbilical artery  
Doppler Waveform



# Selective Growth Restriction in MCDA Twins

- **Investigations:**
- Detailed ultrasound examination
- Ultrasound scans every 1 week to monitor growth, amniotic fluid volume and pulsatility index in the umbilical artery, middle cerebral artery and ductus venosus of both fetuses

# Selective Growth Restriction in MCDA Twins

- **Management:**
- **Types I and II with TTTS:** endoscopic laser ablation of communicating placental vessels.
- **Type I without TTTS:** expectant management with close monitoring to define the best time of delivery. If Doppler findings remain normal then elective Caesarean section at 34-36 weeks. There is intact survival of both twins in 95% of cases.

# Selective Growth Restriction in MCDA Twins

- **Management:**
- **Type II without TTTS:** there is a high risk of perinatal death and handicap for both twins, delivery at 32 weeks indicated.
  - **≥26 weeks:** the best management is close monitoring and delivery if the ductus venosus EDF becomes negative or reversed.
  - **<26 weeks:** the best management is endoscopic laser ablation of communicating placental vessels
  - Survival of the big baby is 70% and of the small baby depends of ductus venosus EDF: 40% if positive and 10% if negative or reversed
  - Risk of neonatal cerebral lesions primarily depends on gestational age at delivery and varies from 20% for birth at <26 weeks to 5% for birth at ≥32 weeks
  - An alternative management is cord occlusion of the small fetus; the survival of the large twin is 90%.

# Selective Growth Restriction in MCDA Twins

- **Type III:**

- The two umbilical cords are adjacent to each other and the behaviour of the pregnancy is similar to that of monoamniotic twins
- Development of TTTS is rare and sudden unexpected death could occur in 20-30% of cases
- Laser surgery may be impossible and the best management is close monitoring and delivery on the basis of ductus venosus EDF in the small fetus
- If the ductus venosus EDF is positive elective delivery should be by Caesarean section at 32 weeks' gestation
- There is a 20% risk of neonatal cerebral lesions and the risk is greater in the larger than small fetus

# Multifetal Pregnancy Reduction (MFPR)



- Difficult consultation at time critical gestational age after dating scan
  - Weighing balance of risk/benefit for all fetuses with optimizing outcome for fewer fetuses
- MFPR best performed between 11-14 weeks gestation
- Chorionicity is paramount in counselling
- Method of reduction depends on chorionicity
- Subspecialist level of knowledge to assess, counsel and perform MFPR but MRCOG level of knowledge to understand principles regarding risk



Potential  
SBA/EMQ

# Multifetal Pregnancy Reduction (MFPR)

	Expectant Mx – miscarriage rate	Intervention – miscarriage Rate	Expectant Mx – preterm birth <33 weeks	Intervention – preterm birth <34 weeks gestation
Quads -> DCDA	25%	12.2%	55%	14%
TCTA -> DCDA	3-7%	7%	35%	13%
DCTA -> MCDA	8-9%	13%	33-46%	23%
DCTA -> Singleton	8-9%	16-19%	33-46%	8%

- **Counselling:**

- 1 in 3 sets of triplets will be born preterm <33 weeks
- 1 in 6 sets of triplets will be born extremely preterm <28 weeks
- MFPR reduces the risk of prematurity and consequently of neurodisability at the expense of a higher risk of miscarriage
- MFPR to MCDA pair still carries a high risk of prematurity due to the risks of MCDA twins and therefore is not routinely offered



# Multiple Pregnancies – Preterm Birth Prevention

- Recommended:
  - Asymptomatic – Single cervical length measurement at >18 weeks
  - Symptomatic – Combined fFN and cervical length
- Not recommended:
  - Asymptomatic – Serial cervical length, fFN (NICE), routine progesterone (suggestion of harm), routine cerclage, tocolysis
  - Symptomatic - Tocolysis
- Uncertain if good or bad "further research needed":
  - Progesterone if short cervix (probably works)
  - Arabin if short cervix (probably works)
  - Rescue cerclage (Oxford data says it does work but for the exam..)



Potential  
SBA/EMQ

**OXCOG**

**OXCOG.CO.UK**

---

# Fetal Growth Restriction, MCDA Twins & Higher Order Multiple Pregnancy

MRCOG Part 2 Online Revision Course

Miss Kit Robertson – Consultant in Obstetrics and  
Maternal-Fetal Medicine, Oxford University Hospitals