FETAL GROWTH RESTRICTION
UA DOPPLER & AFI
OBSTETRICAL ULTRASOUND PROTOCOL

GESTATIONAL AGE: For FGR pregnancies 23wks to term ***(may be requested earlier)***

BILLING CODES:
UOBF & UOBUA ***(76816 & 76820)***
For Multiples: UOBF & UOBUA ***(76816 & 76820 for each fetus)***
If Ductus Venosus Doppler performed: change UOBUA to UOBORGDL

PATIENT PREP: None

DESCRIPTION: This exam is used for monitoring singleton FGR or di-di twin FGR pregnancies. FGR is defined as an EFW or AC measuring ≤10%. Anatomy not cleared on prior exam will be evaluated at next growth ultrasound unless time allows or is part of the requirements below. See specialized protocol for TTTS/TAPS for all mono-di and mono-mono pregnancies.

DATING: As a routine, use the date provided by the clinician or patient's known LMP. Working EDD in EPIC should be used if more than one date is provided. Use AIUM and ACOG dating criteria if dating is unknown. Guidelines for redating based on ultrasound can be found here

IMAGES TO OBTAIN

Additional images may be requested as needed in addition to the basic requirements listed below.

FETAL POSITION
FETAL HEART RATE with M-mode
4CH CINE CLIP - showing contractility and assess for pericardial fluid
KIDNEYS - transverse and sagittal with measurements
STOMACH - transverse view
BLADDER- transverse view
UA DOPPLER according to specifications below
AMNIOTIC FLUID VOLUME:

- 20-24 weeks: AFI evaluation should be done using MVP. If abnormal, obtain a four quadrant AFI.
- After 24 weeks, or if it appears abnormal before 24 weeks: Evaluation should be done using a four quadrant AFI
- For multiple gestations (twins, triplets, etc): Always measure the MVP unless Mono/mono gestation, then use four quadrant measurements.
- Fluid pockets measured should be greater than 1cm in width.

AMNIOTIC FLUID INDEX 4 quadrant

<5cm	Oligohydramnios
5-24 cm	Normal
≥ 24 cm	Polyhydramnios

MVP and TWINS single largest pocket

<2 cm	Oligohydramnios
2-8 cm	Normal
≥ 8 cm	Polyhydramnios

BIOMETRY ***typically every 3 weeks unless stated otherwise:***

Measure each of the following at 2-3 times:

BPD –measured on an axial plane that traverses the thalami and CSP

HC – include in image with BPD**.** If ≤ 2%, Microcephaly protocol should be performed

AC - Transverse image through the upper abdomen at the level of the fetal stomach, umbilical vein and portal sinus.

Femur - See additional image requirements if HL or FL measure ≤ 2%

UMBILICAL ARTERY DOPPLER: Perform UA Doppler as requested, or if the AC or EFW is ≤10% after 23 weeks (current age of viability.) For multiple, regardless of chorionicity, UA Doppler should be taken for BOTH twins if one is FGR.

TECHNIQUE:

- At least 3 spectral Doppler samples of the umbilical artery using the auto trace method at the middle section of the umbilical cord.
- **Preference**: 4 spectral Doppler samples of the umbilical artery, 2 from each artery
- The sample with the highest S/D ratio is documented in the OB report.
- Avoid being close to the fetus or placental cord insertions.
- For multiples, if necessary, the cord can be traced from fetal cord insertion to ensure the proper fetal cord is documented in cases where it is challenging to determine which cord corresponds to a certain fetus. In this case, it should be clearly stated on the report that the Doppler was obtained at the fetal end to accurately compare to prior and future measurements.
- If a dramatic difference is seen in S/D ratios between exams, BOTH umbilical arteries should be sampled and compared. There are cases where one artery has normal flow, and the other is abnormal. Describe this in the report if this is the case.

INTERPRETATION:

- An umbilical artery S/D ratio of > 95th percentile is considered abnormal.
- If absent end diastolic flow (or reversed diastolic flow) is seen, this needs to be reported urgently via a phone call to the clinical team before the patient leaves. The patient may be admitted.
- If absent or end diastolic flow is present additional imaging of ductus venosus is indicated.
- Absent or reversed diastolic flow does not mean that the S/D is = 1. For these cases, only include the peak systolic velocity and report these as “Absent diastolic flow,” or “Reversed diastolic flow.”

See below information for adding ductus venosus doppler if absent or reversed diastolic flow is seen in the umbilical artery.

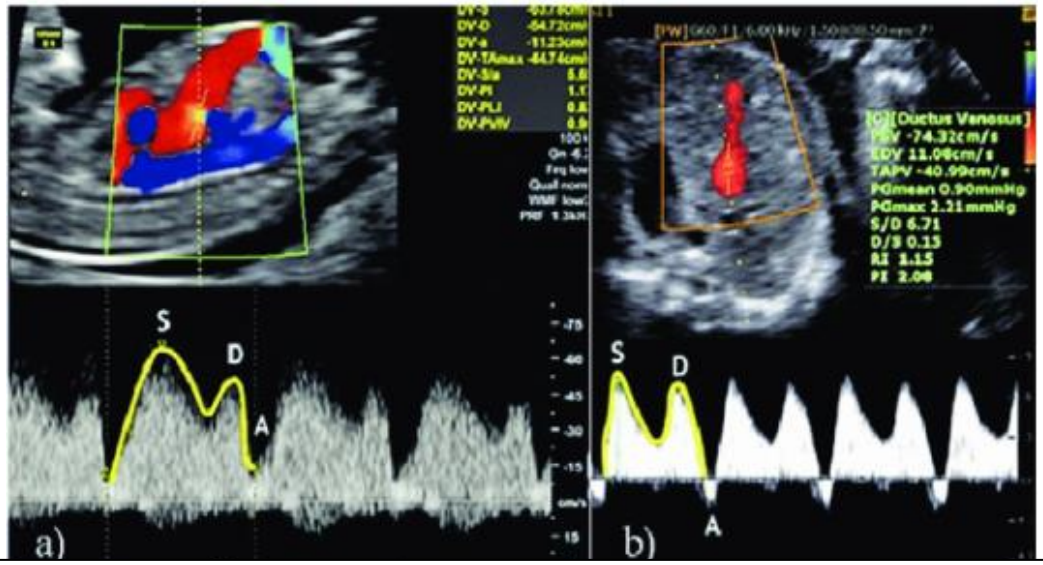
DUCTUS VENOSUS: To be performed as requested, or if absent or reversed umbilical artery doppler is observed.

TECHNIQUE:

- Sample where the umbilical vein joins the ductus venosus and where color aliasing can often be seen.
- The sweep speed should be set high enough for best assessment of the A wave.
- Set the wall filter low enough so that the A wave is not obscured
- Fetus should be as still as possible, variability in the heights of the S and D waves may indicate fetal breathing, which is normal, but wait for the fetus to be more still before evaluating.

INTERPRETATION:

- Flow should always be in a forward direction towards the heart.
- Flow in the ductus venosus has a characteristic triphasic waveform. This triphasic waveform comprises of:
  - S wave: corresponds to fetal ventricular systolic contraction and is the highest peak
  - D wave: corresponds to fetal early ventricular diastole and is the second highest peak
  - A wave: corresponds to fetal atrial contraction and is the lowest point in the wave form albeit still being in the forward direction, reversal of the A wave is always abnormal.



a) Doppler of the ductus venosus with normal triphasic flow obtained with the sample volume of the pulsed Doppler in the sagittal plane. b) An abnormal reversed A wave obtained in a transverse plane. S=systolic; D=Diastolic; A=pre-systolic wave.

UMBILICAL ARTERY & AFI IMAGE LIST

IMAGE	MODE
Position	2D
FHR	M-Mode
4CH cine clip	Cine
Kidneys	2D
Stomach	2D
Bladder	2D
AFI	2D
UA Doppler x 4, 2 of each artery	Spectral
Biometry as requested ~3wks	
Ductus Venosus if indicated	*Spectral*

UA DOPPLER AND AFI PROTOCOL HISTORY

	Date	Changes made	By whom
Created	5/3/2022		Renee Betit Fitzgerald
Updated	5/19/20322	Added to Doppler section – -Do both twins if either is ordered -Ok to follow cord from abdomen to ensure correct fetus in multiples -Sample both arteries if big discrepancy between exams	Renee Betit Fitzgerald
Change	9/29/2022	UA dopplers for Di-Di Twins only to be done on FGR twin. Mono-di/Mono-Mono will remain both twins	Manjiri Dighe and Edith Cheng
Added	5/1/2023	Added anatomy not cleared on prior will be evaluated at next growth ultrasound.	OB Protocol Meeting 4/27 Dighe, Cheng, Ma, Hitti, Shaun, Renee, Dalene
Change	7/25/2024	Di-Di Twins: UA Doppler should be obtained for BOTH twins when one is FGR	Combined Protocol Meeting MFM/RAD Attendees: M. Dighe, E. Cheng, J. Hitti, M. Richley, S Bornemeier, B. Marion, R. Betit Fitzgerald
Updated	7/8/2025	Changed: Billing code to UOBF because of new images looking for potential pathology in FGR instances Changed: AFI range charts Added: 4ch clip, stomach, bladder, kidneys, Changed: Preferred: UA x 2 of each artery Added: Biometry as requested Added: DV if UA is absent or reversed EDF	Amie Hollard Renee Betit Fitzgerald