How Fetal ECHO Can Aid in the Management of Monochorionic Twins

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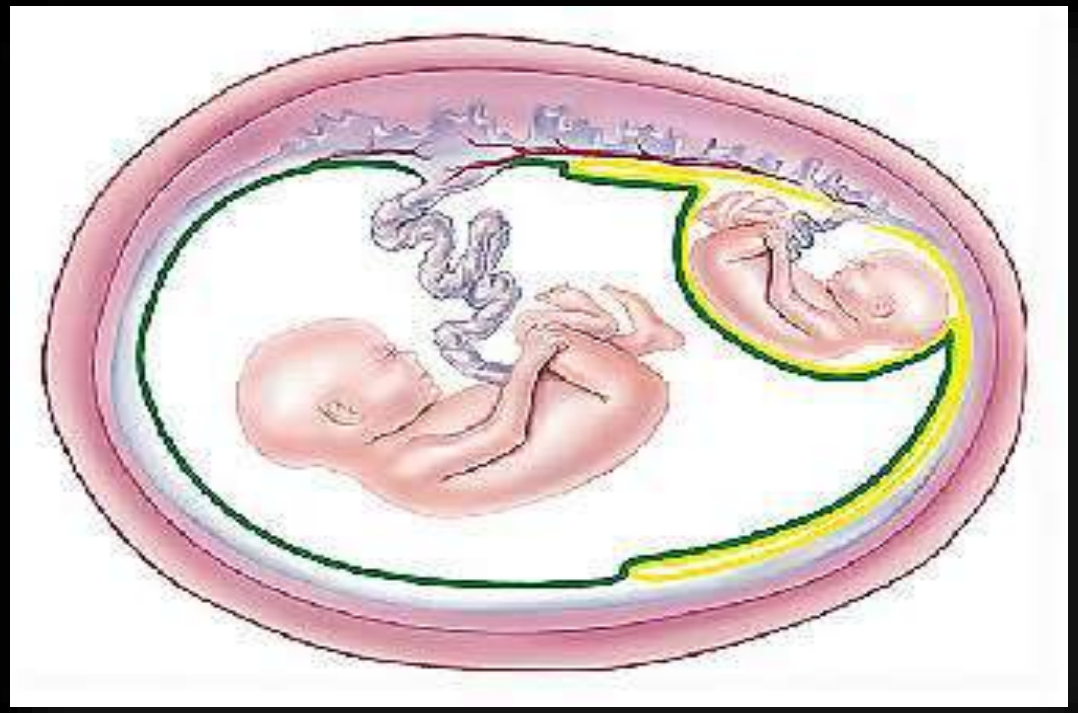
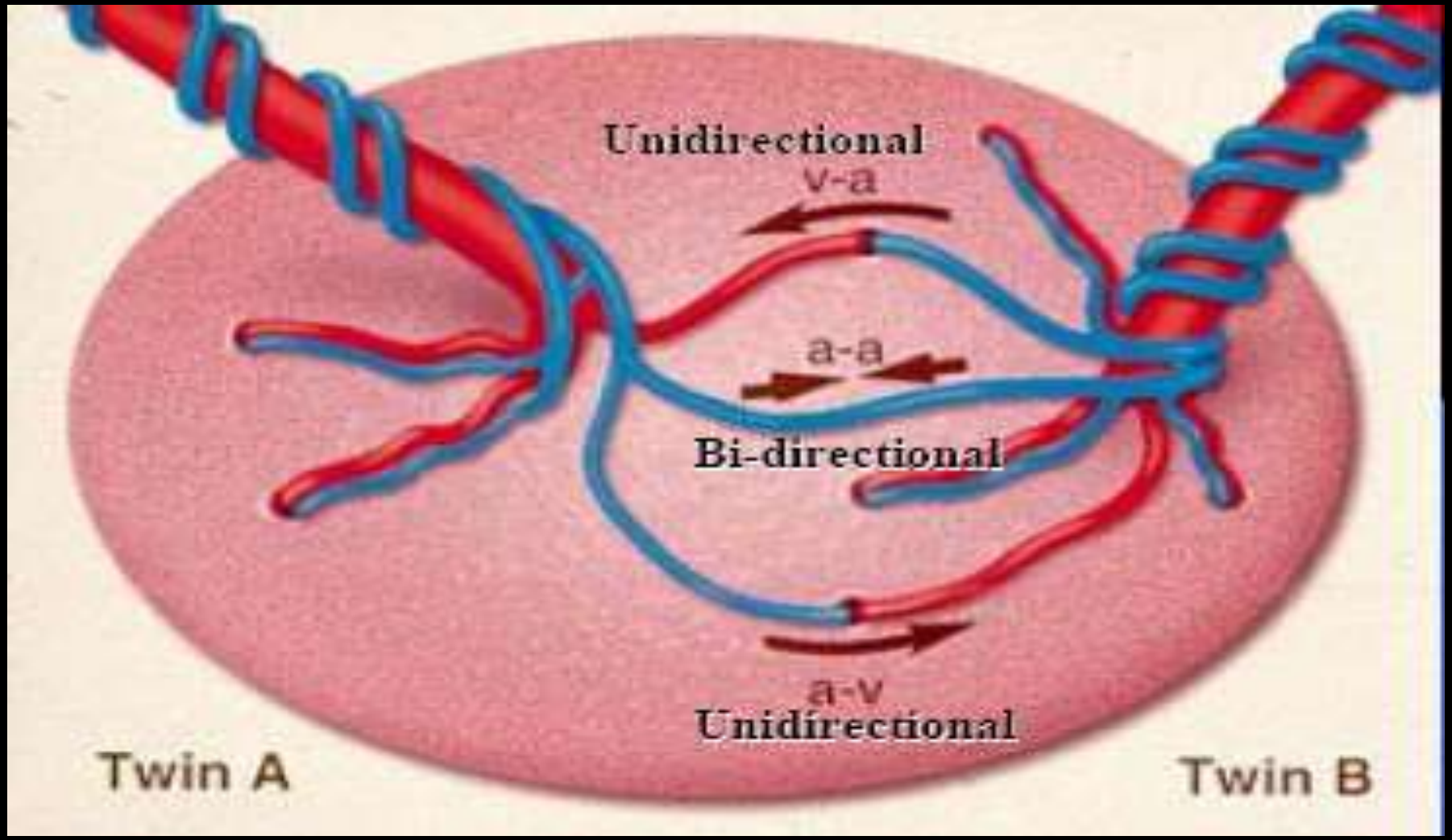
Twin-Twin Transfusion Syndrome



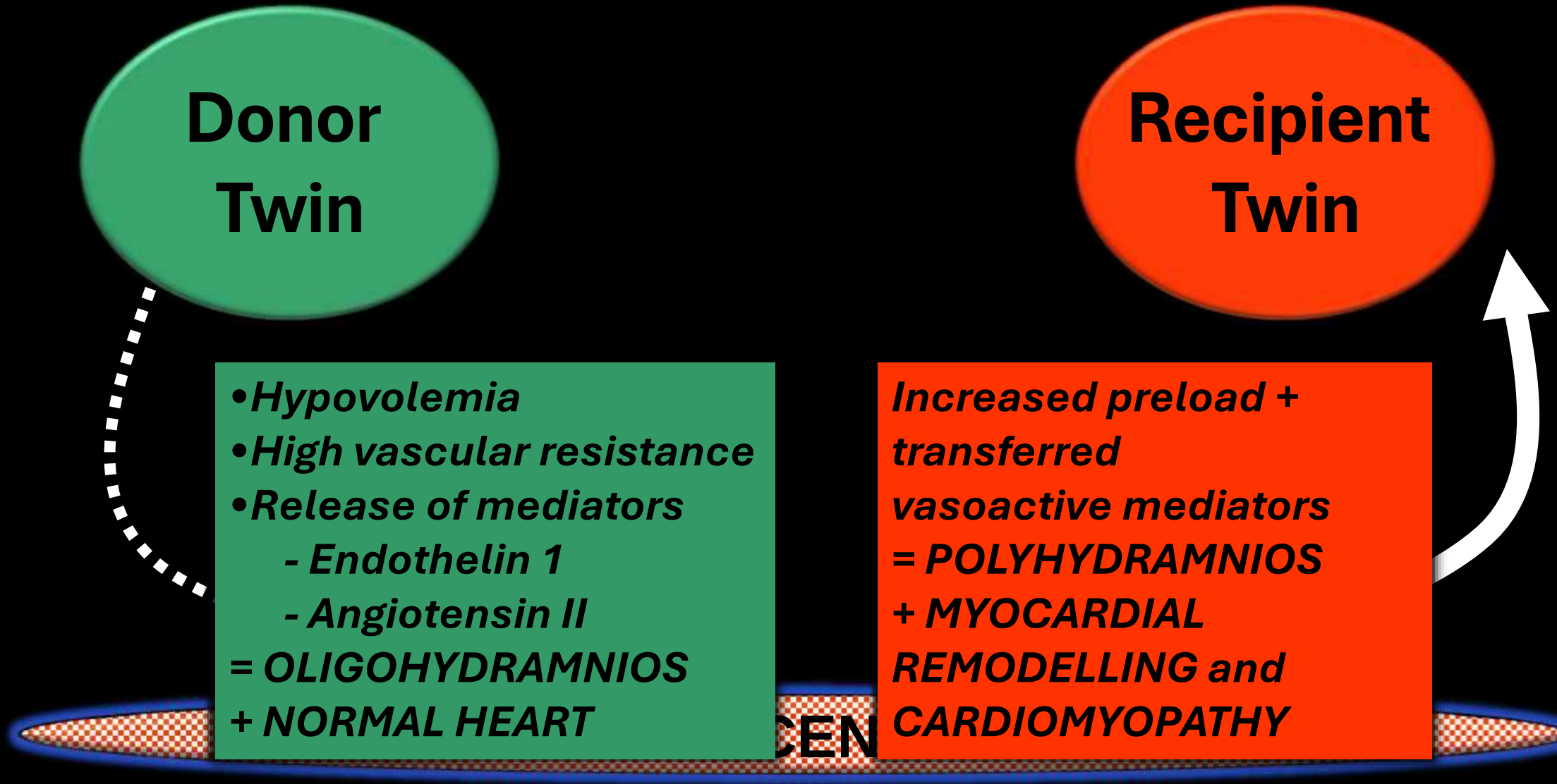
- ***Monochorionic***
- ***Polyhydramnios/oligohydramnios***
- ***Size discrepancy***

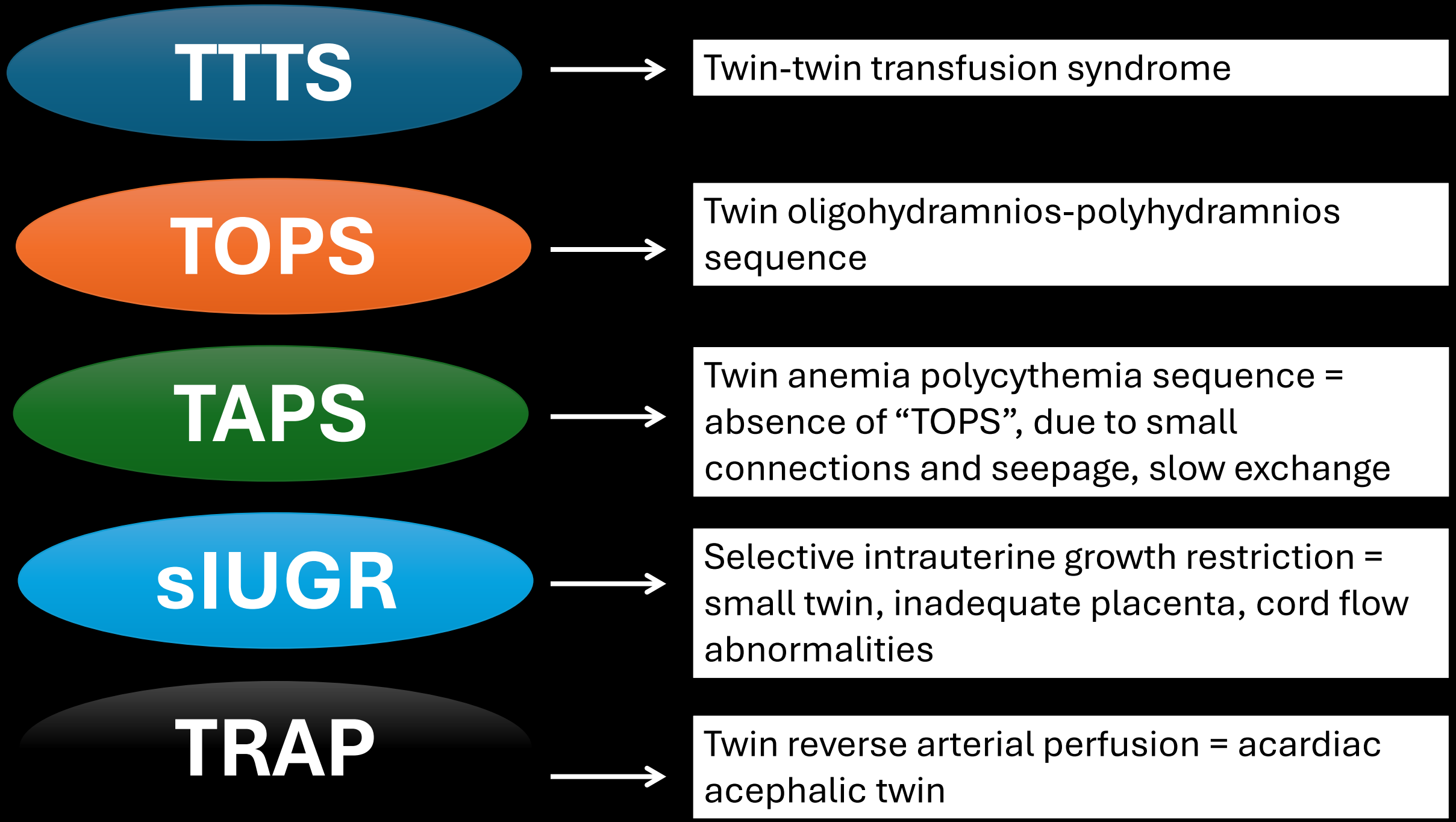
- TTTS affects 15% of monochorionic twins
- Untreated perinatal mortality ↑ 70%
- Morbidity = cardiovascular + CNS
- Despite advances still high risk for perinatal morbidity and mortality

TTTS = “Placental Vasculopathy”



TTTS Hypothesis

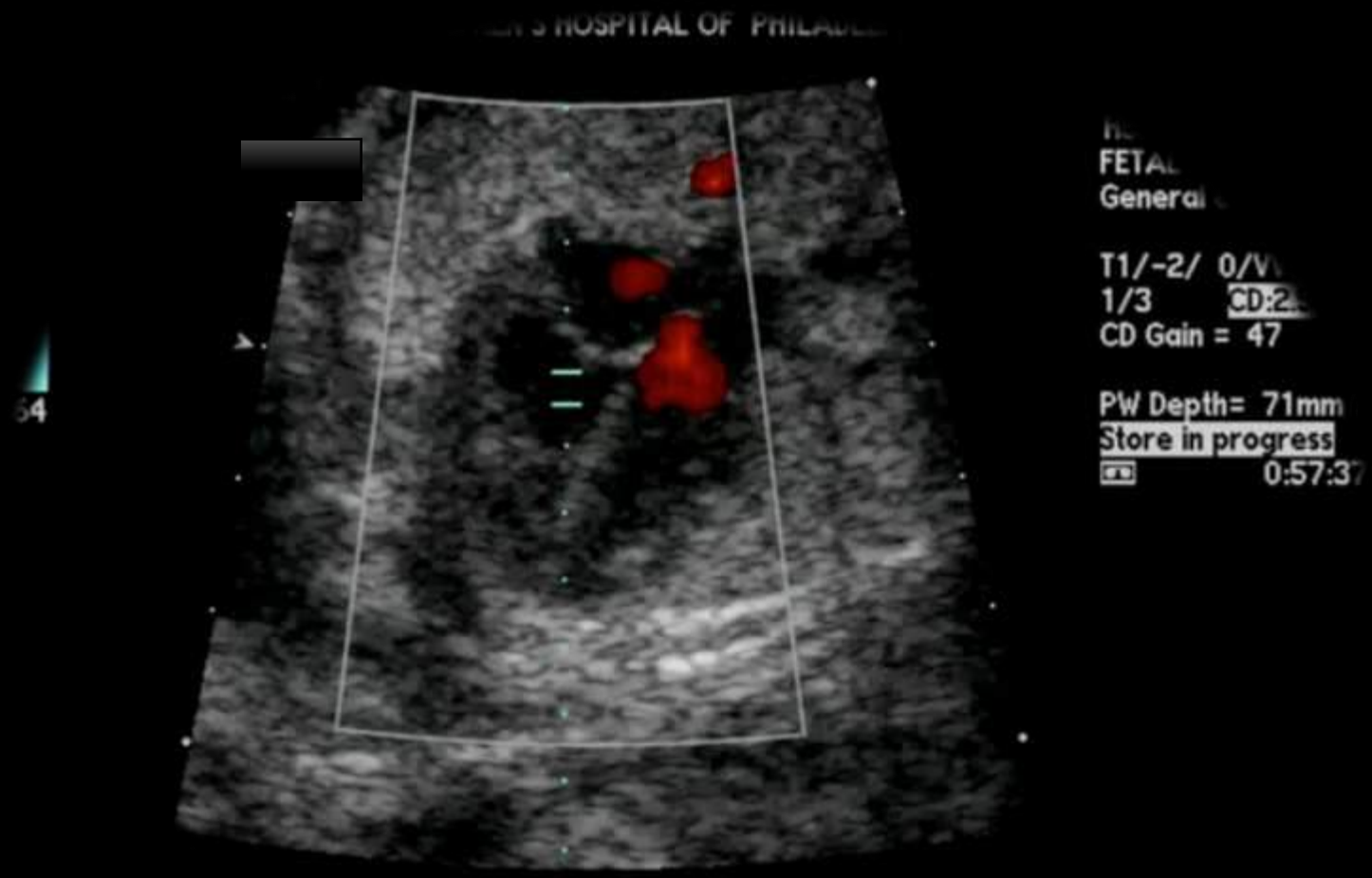



TTTS
Twin-twin transfusion syndrome
TOPS
Twin oligohydramnios-polyhydramnios sequence
TAPS
Twin anemia polycythemia sequence = absence of “TOPS”, due to small connections and seepage, slow exchange
sIUGR
Selective intrauterine growth restriction = small twin, inadequate placenta, cord flow abnormalities
TRAP
Twin reverse arterial perfusion = acardiac acephalic twin

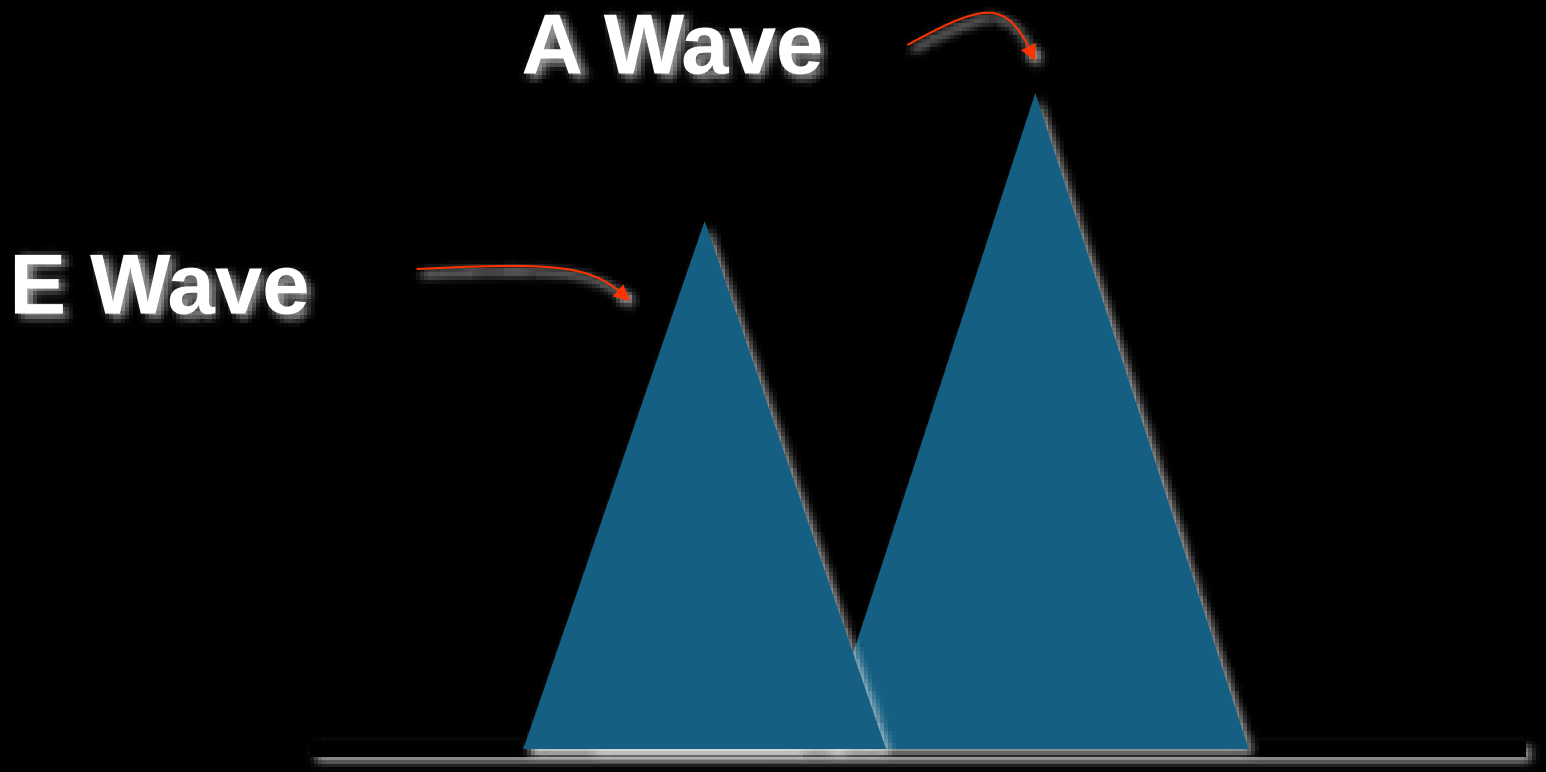
Disease Severity in TTTS is Measured by Quintero Staging System

QUINTERO STAGE	FINDINGS
STAGE I	twin size discrepancy and polyhydramnios + oligohydramnios sequence
STAGE II	absent bladder filling in donor
STAGE III	“critical Doppler abnormalities” (UA, UV and Ductus Venosus)
STAGE IV	fetal hydrops
STAGE V	fetal demise

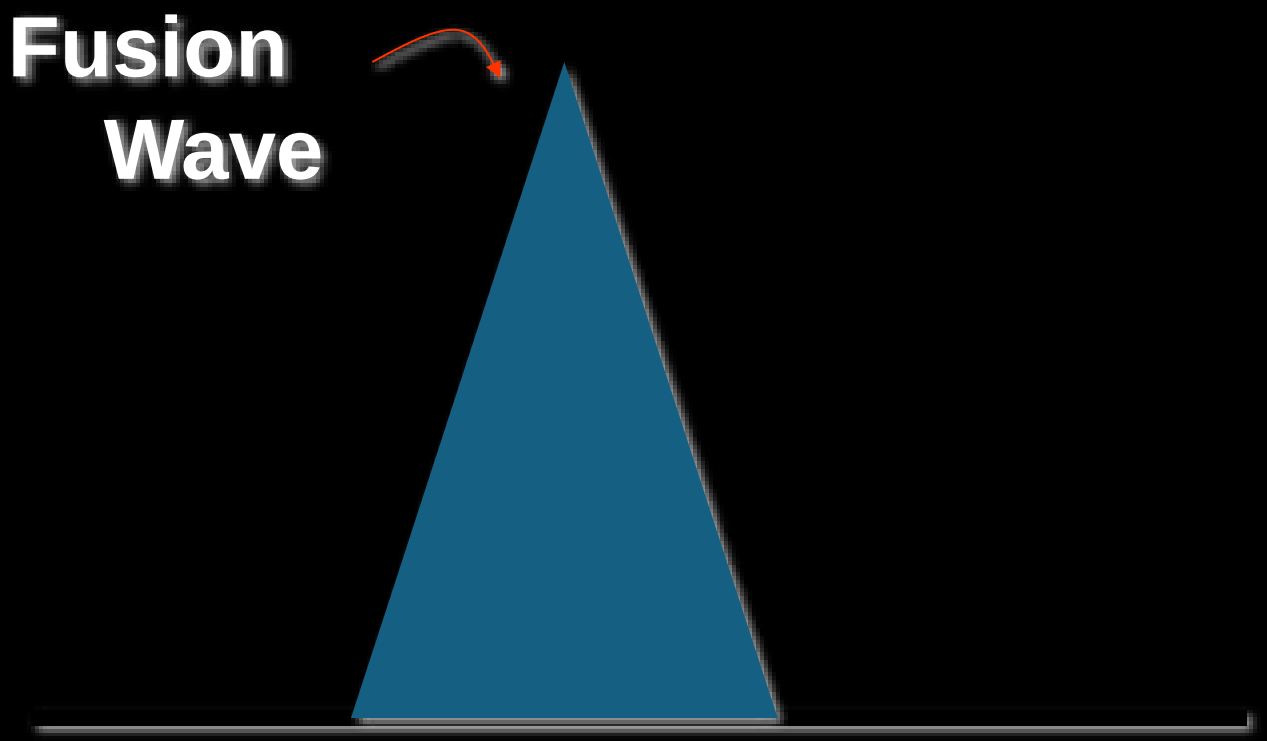
Inflow Across the Tricuspid Valve



Changes in Doppler Inflow In Relation to Changes in Compliance



Changes in Doppler Inflow In Relation to Changes in Compliance



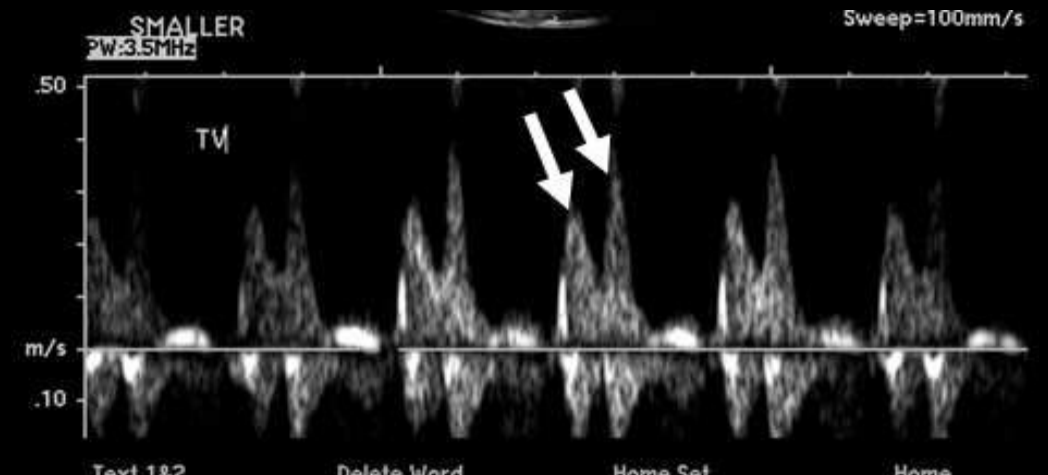
Tricuspid and Mitral Inflow Patterns

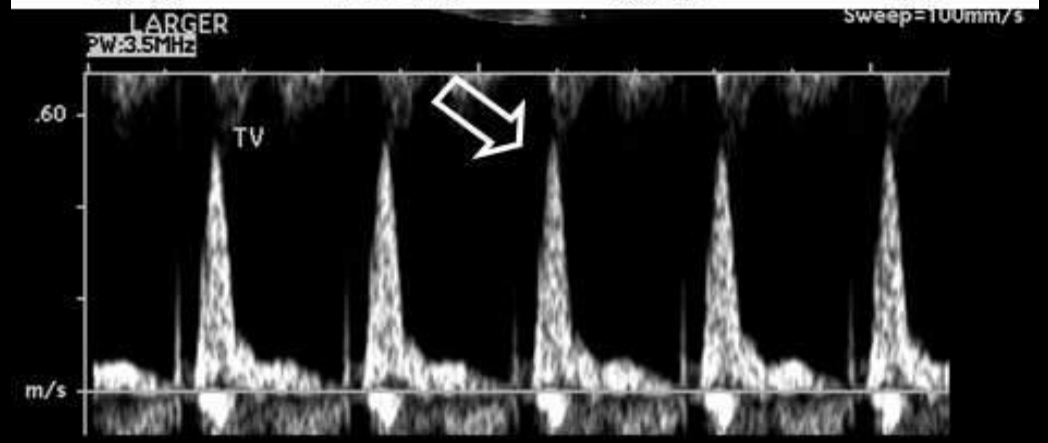
Tricuspid Valve

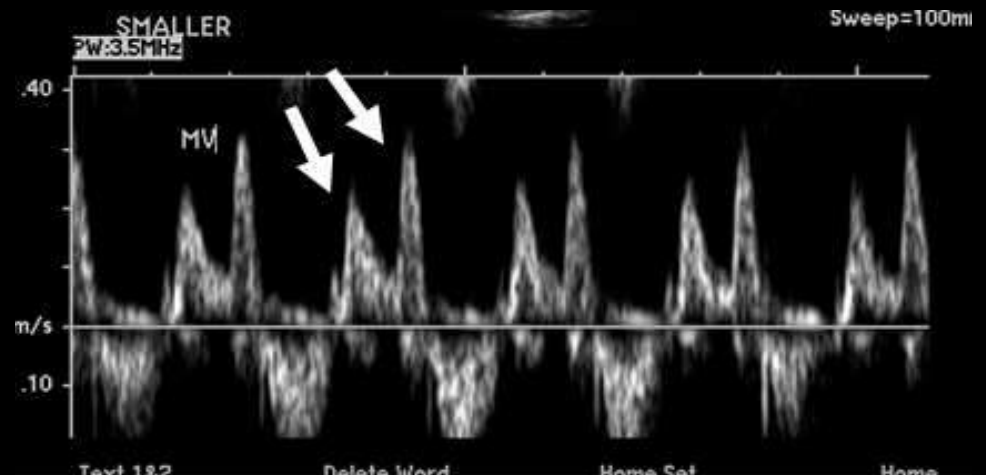
Mitral Valve

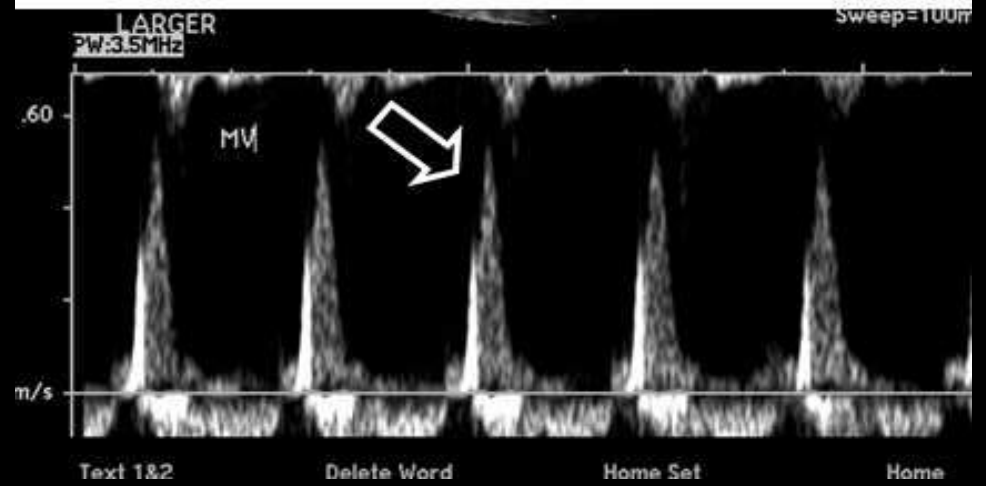
DONOR

REC





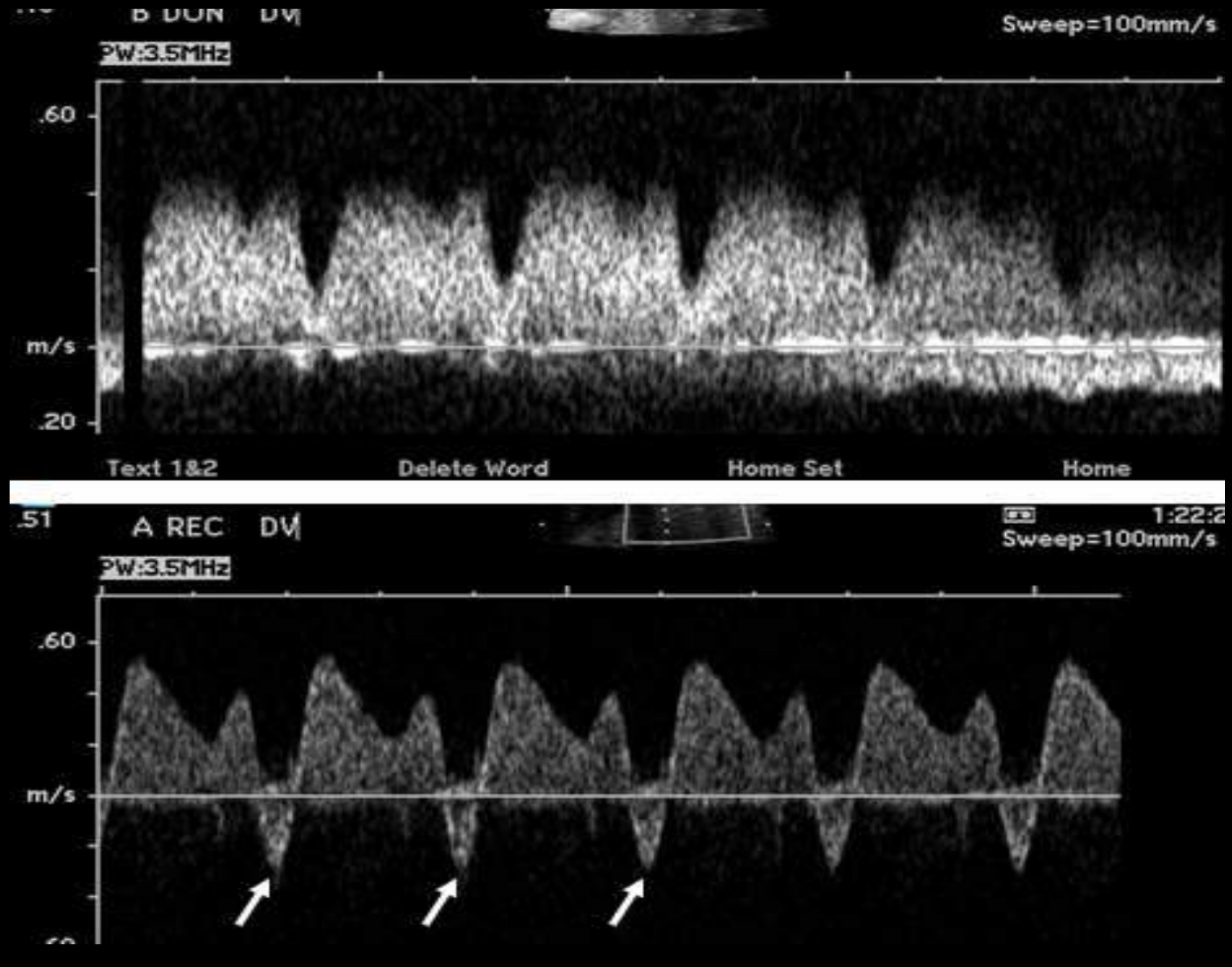




Ductus Venosus Flow Pattern

Donor

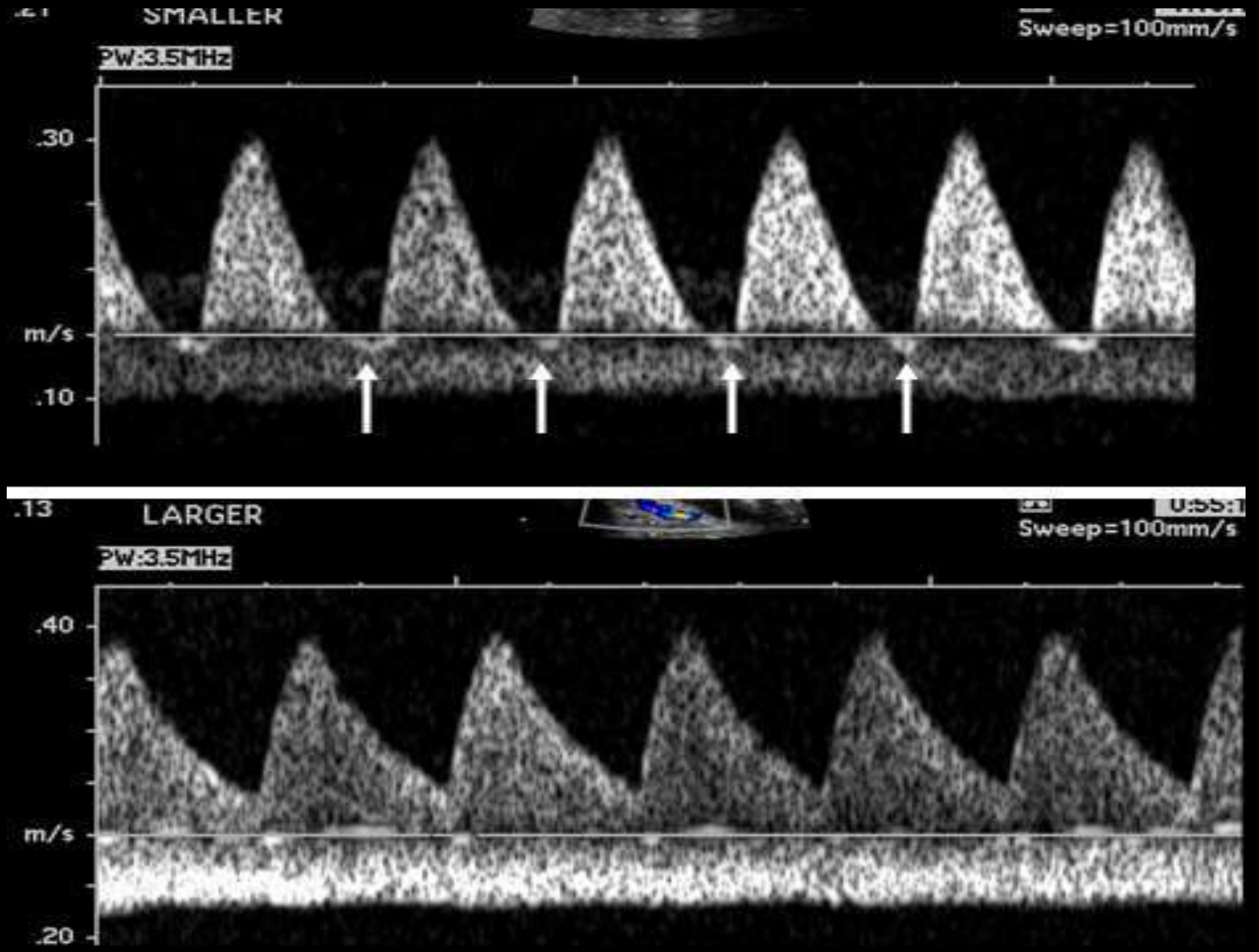
Recipient



Umbilical Artery Flow Patterns

Donor

Recipient



Domains and Specific Elements of the CHOP TTTS Score (max score = 20)

1. Ventricular Elements

Cardiac Enlargement	None (0)	Mild (1)	> Mild (2)
Systolic Dysfx	None (0)	Mild (1)	> Mild (2)
Vent Hypertrophy	None (0)	Present (1)	

2. Valve Function

Tric Regurg	None (0)	Mild (1)	> Mild (2)
Mitral Regurg	None (0)	Mild (1)	> Mild (2)

3. Venous Doppler

Tric Inflow	2 peaks (0)	1 peak (1)	
Mitral Inflow	2 peaks (0)	1 peak (1)	
Duct Venosus	All forward (0)	Decreased (1)	Reversal (2)
UV Pulsation	None (0)	Present (1)	

4. Great Vessel Analysis

Outflow Tracts	PA > Ao (0)	PA = Ao (1)	PA < Ao (2)
			RVOTO (3)
Pulm Insufficiency	None (0)	Present (1)	

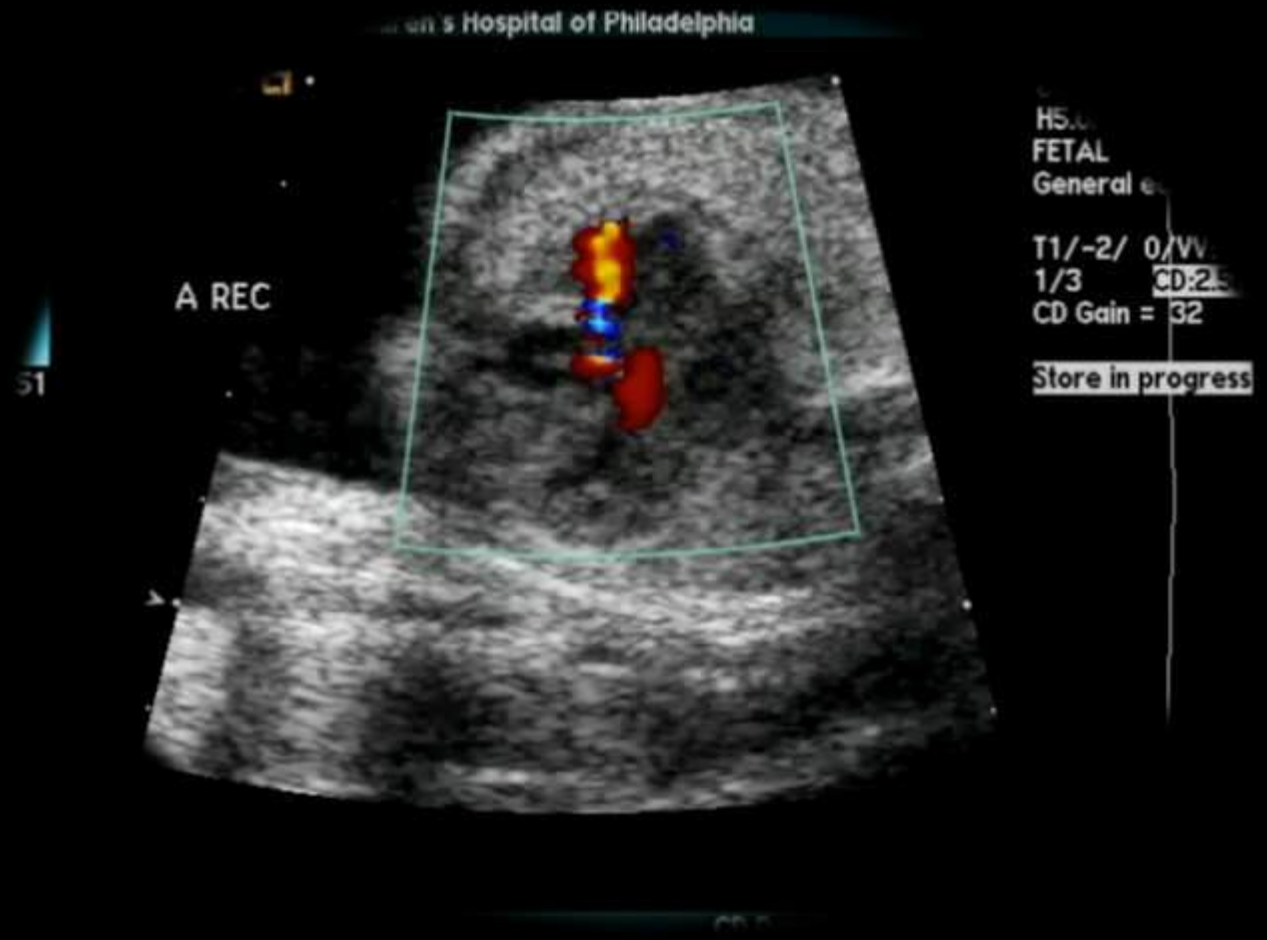
5. Umbilical Art Flow in Donor

UA Doppler	Normal (0)	Decreased Diastolic flow (1)	Absent or reversed diast flow (2)

What Does This Look Like?

Courtesy of Michael Bebbington, MD, Fetal Care Center, WUSTL, St Louis, MO

Pre laser


s Hospital of Philadelphia
A REC
FETAL
1/3
CD Gain = 32
Store in progress

Pre laser

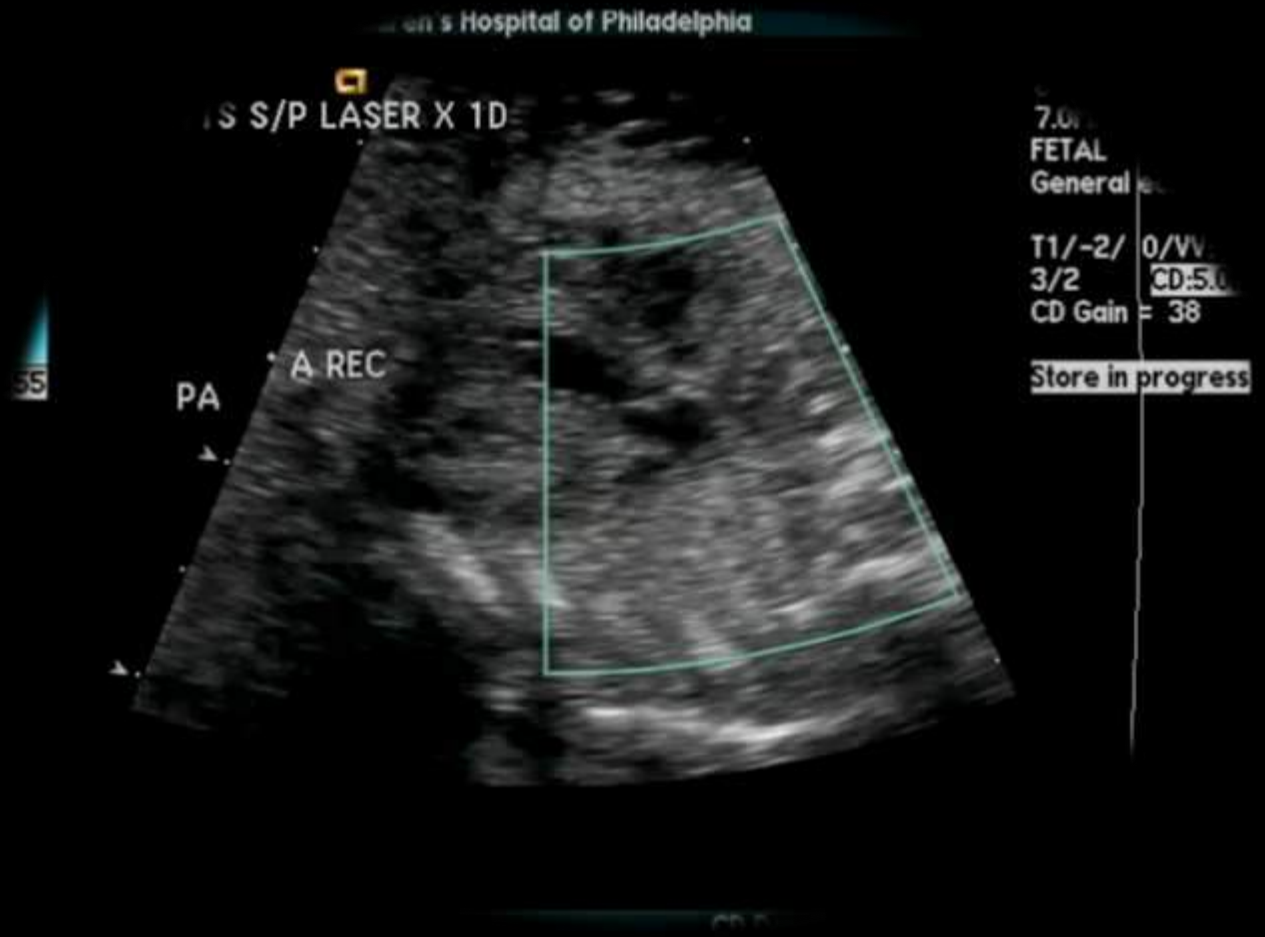

Hospital of Philadelphia
A REC
PA
FETAL
General
60dB
Gain= -5dB
Store in progress

Pre laser


s Hospital of Philadelphia
A REC
FETAL
General
T1/~2/ 0/VV
1/3
CD Gain = 42
Store in progress

1 Day After Laser...

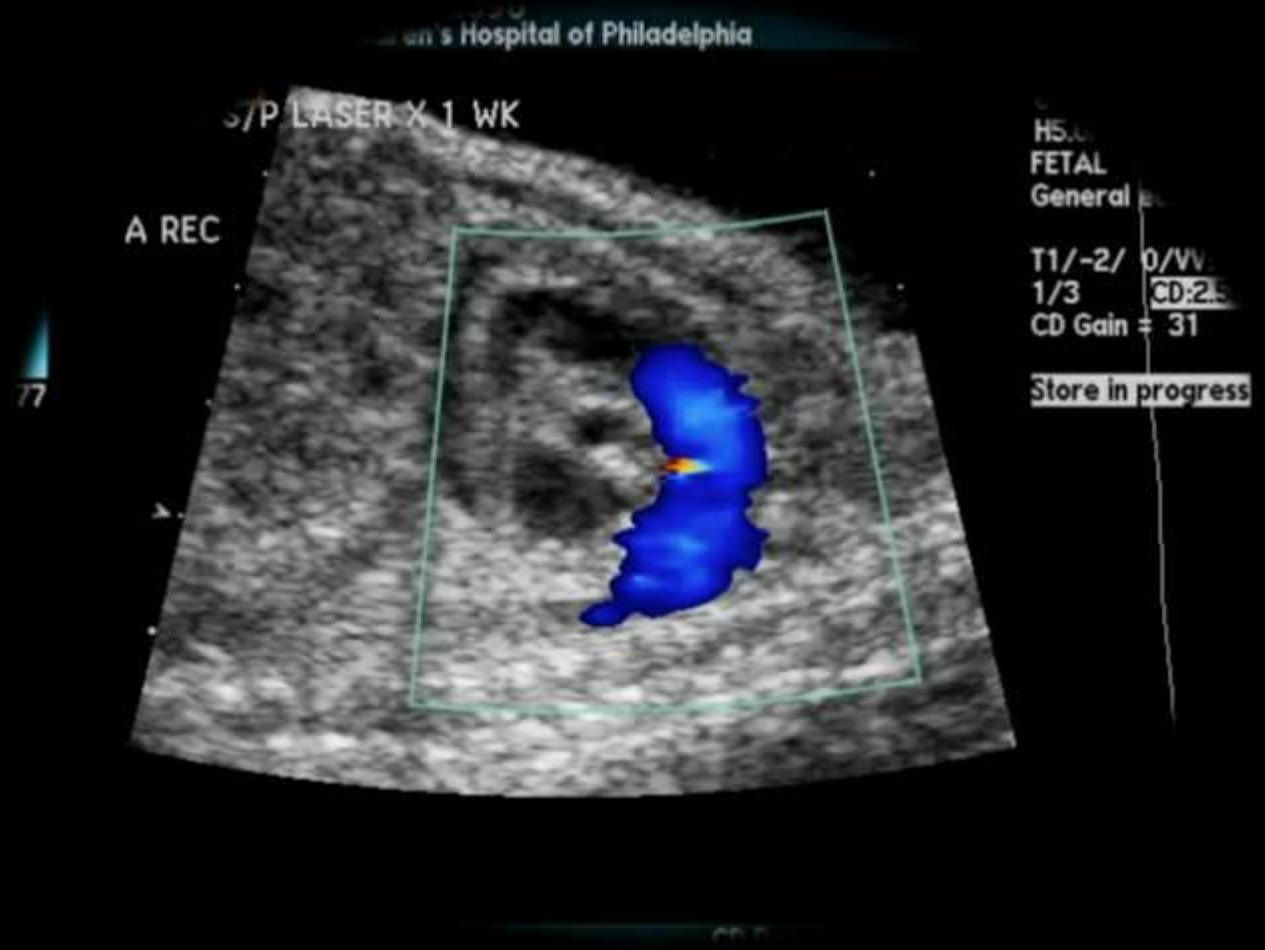
1 Day After Laser...



1 Week after Laser...

1 Week after Laser...

1 Week after Laser...

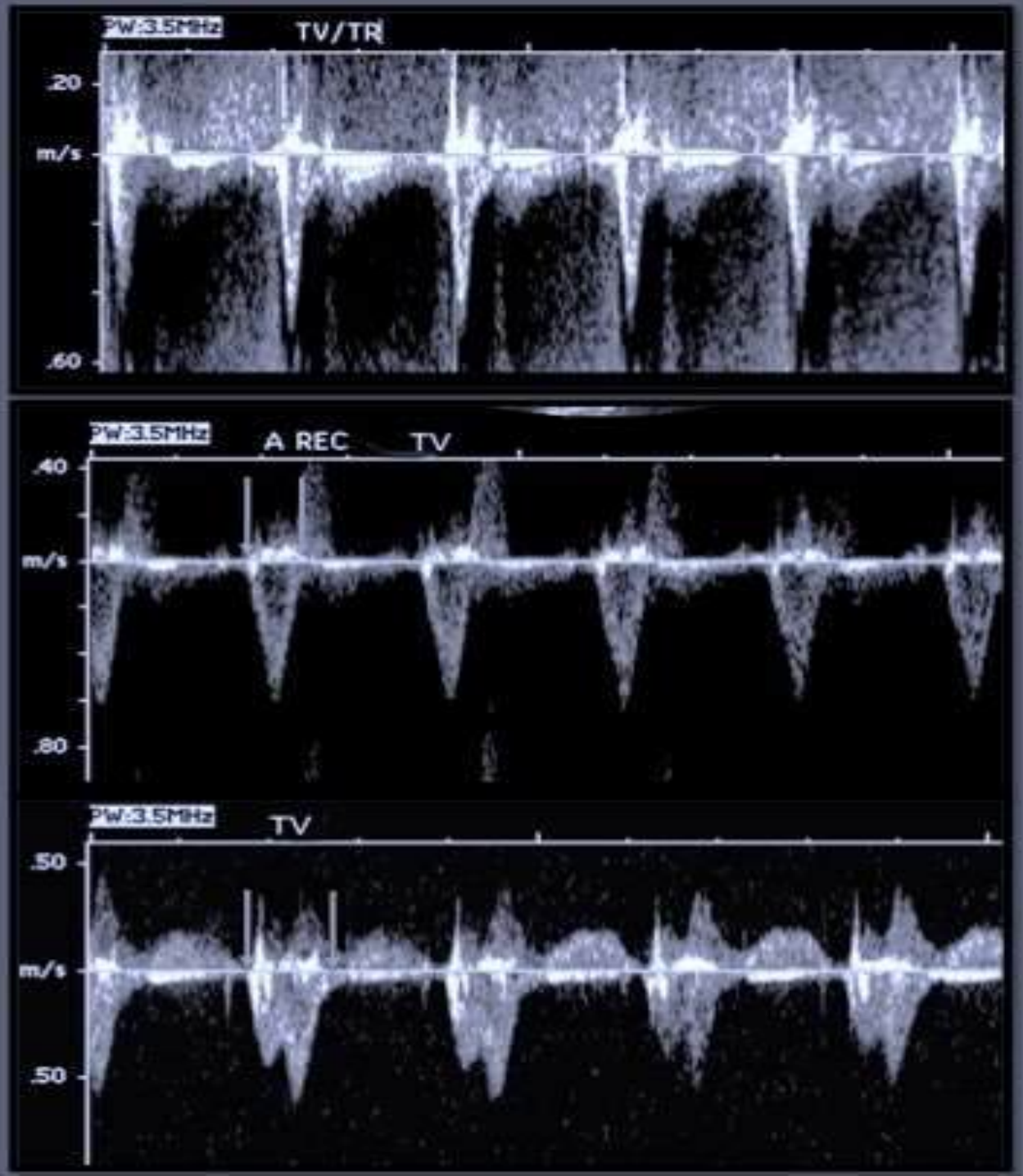


Tricuspid Valve Inflow

A. Before laser therapy.

B. One day after laser.

C. One week after laser.

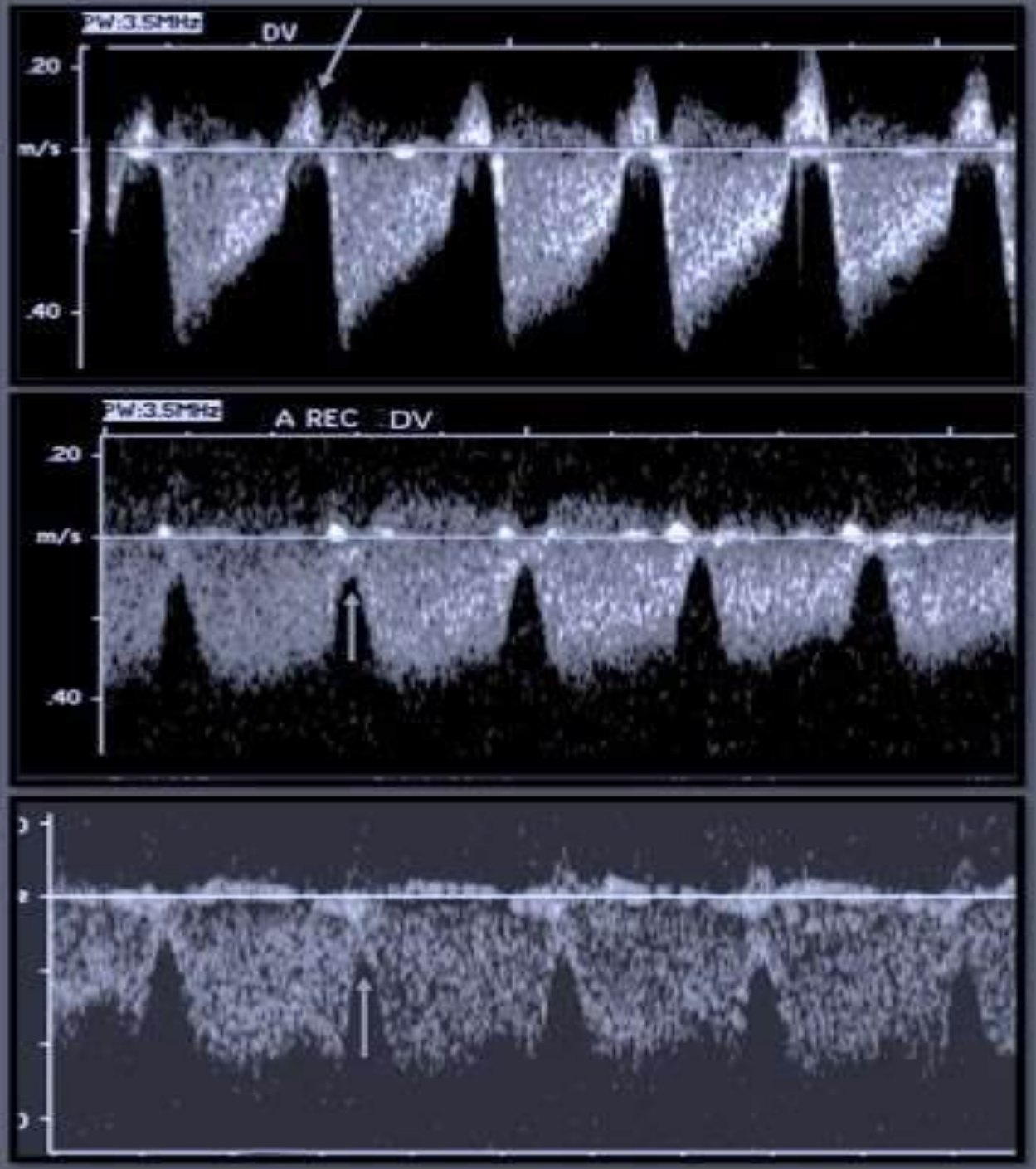


Ductus Venosus Flow

A. Before laser therapy.

B. One day after laser.

C. One week after laser.

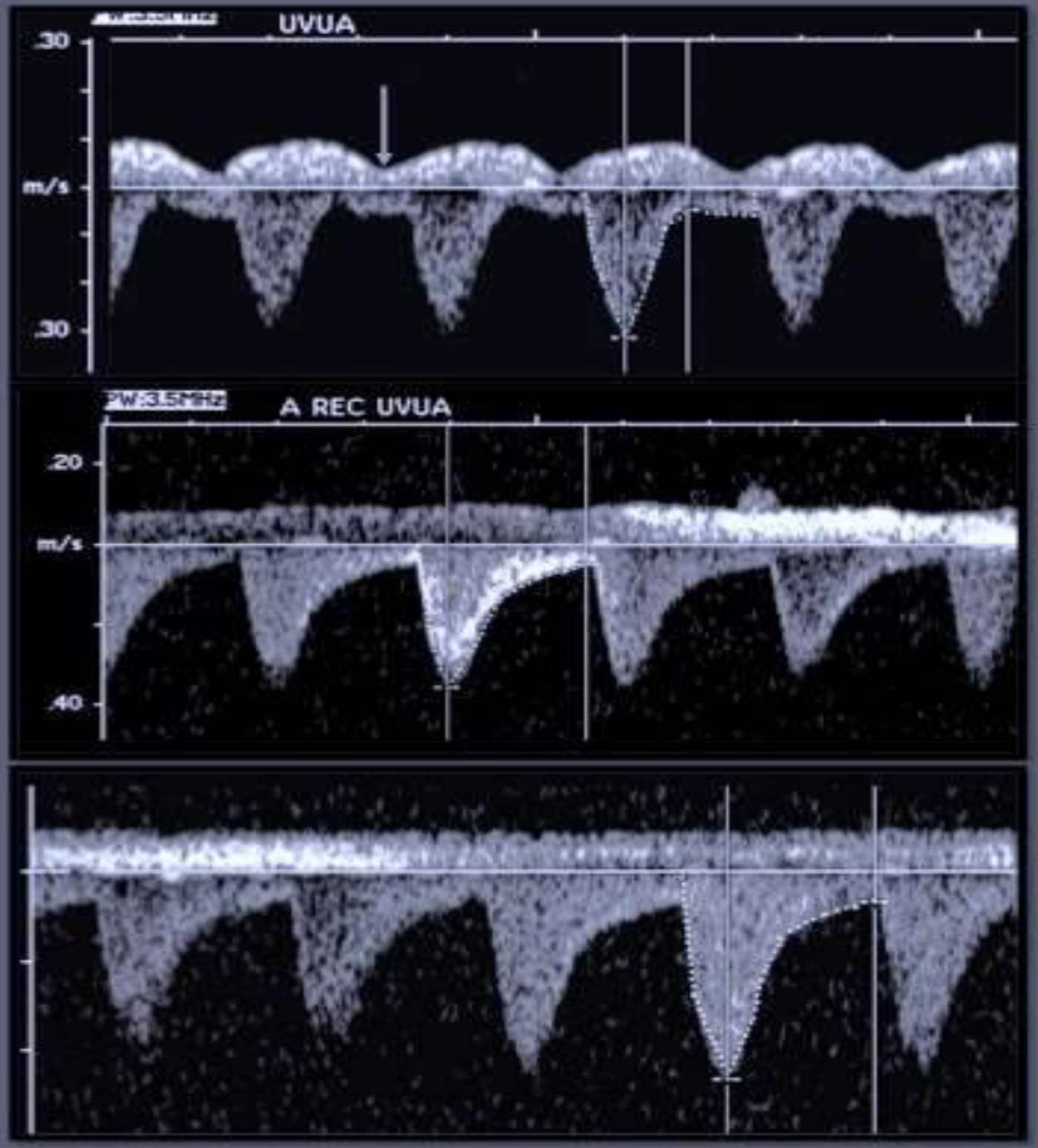


Umbilical Venous Flow

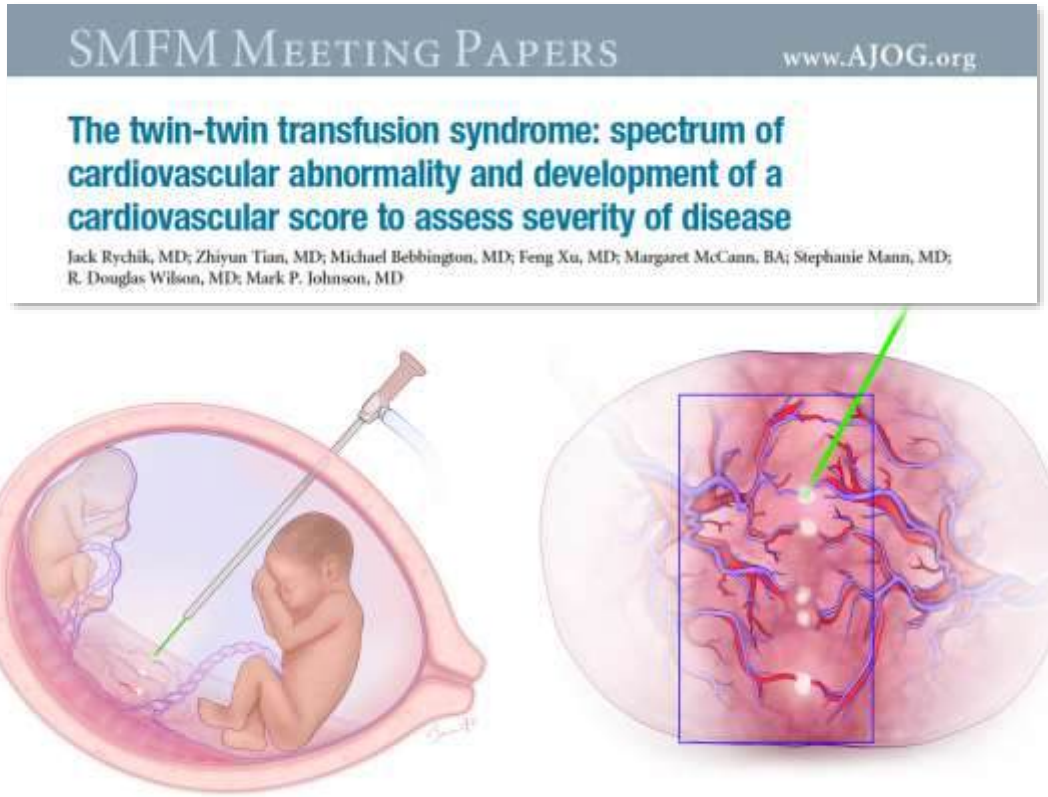
A. Before laser therapy.

B. One day after laser.

C. One week after laser.

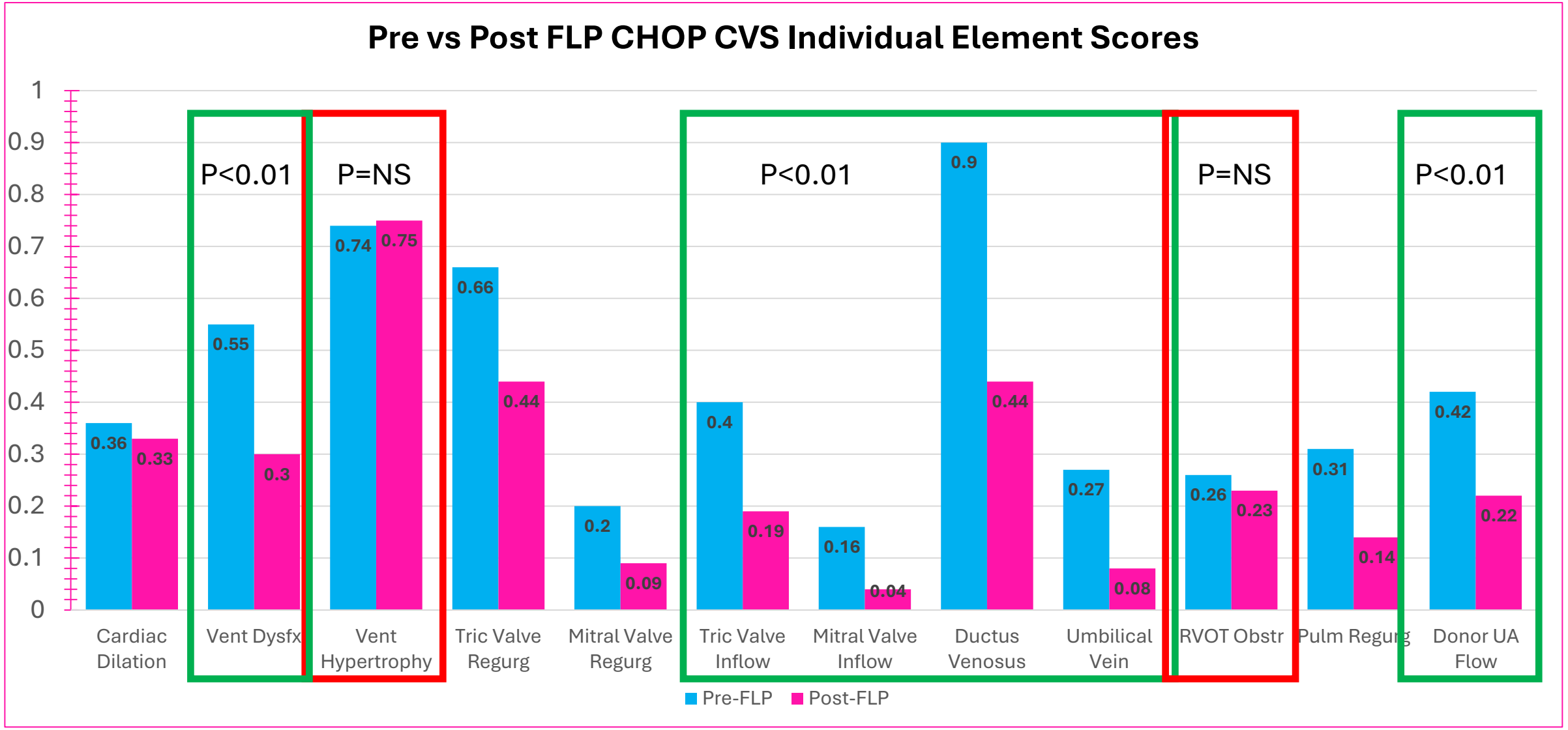


Early Reduction in Cardiovascular Burden Following Fetoscopic Placental Laser Photocoagulation in TTTS



<u>AIMS</u>: ***Explore early 1-week impact of FLP on fetal CV burden in TTTS***

RESULTS


Pre vs Post FLP CHOP CVS Individual Element Scores
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
P<0.01
P=NS
P<0.01
P=NS
P<0.01
0.36
0.33
0.55
0.3
0.74
0.75
0.66
0.44
0.2
0.09
0.4
0.19
0.16
0.04
0.9
0.44
0.27
0.08
0.26
0.23
0.31
0.14
0.42
0.22
Cardiac Dilation
Vent Dysfx
Vent Hypertrophy
Tric Valve Regurg
Mitral Valve Regurg
Tric Valve Inflow
Mitral Valve Inflow
Ductus Venosus
Umbilical Vein
RVOT Obstr
Pulm Regurg
Donor UA Flow
Pre-FLP
Post-FLP

What is TTTS Telling Us?

- The fetal heart exhibits remarkable plasticity
- The fetal myocardium is quite sensitive to loading conditions and “agents” that can profoundly influence structure and function
- What exactly are these influencing factors/agents in TTTS?....uniqueness of fetal myocytes?
- Can we better understand this phenomenon and moderate other forms of “congenital” heart disease?
- What might we expect as long-term outcomes for survivors of TTTS from perspectives of fetal programming?