# SUMMARY OF DOPPLER PARAMETERS

N.B.THIS SUMMARY IS HELPFUL FOR WHO's ALLREADY TRAINED TO USE DOPPLER
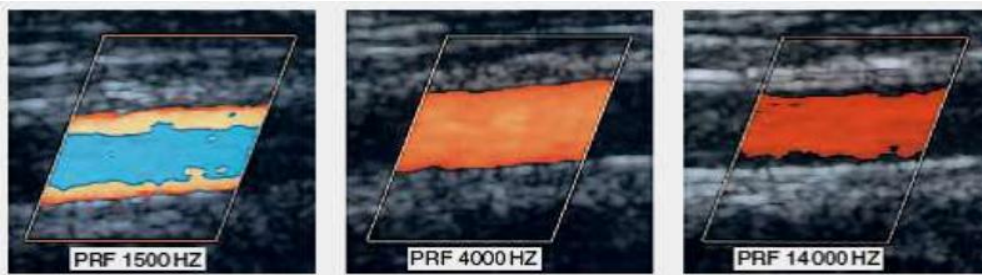
↘ **MAIN TYPES OF FLOW** : - Arterial   - Venous

↘ **SETTING:** Don't forget to adjust

- o **Mode of scan** "Arterial , Venous , Abd. , scrotal .....etc"
- o **Probe** : Curved → Deep / Linear → Superficial
- o Color Gain
- o **Angle** = < 60 (Not 90 , as Cos 90 = 0 → No Doppler signal"
- o **"Gate"** Sample Volume " = " at middle part of Vessel
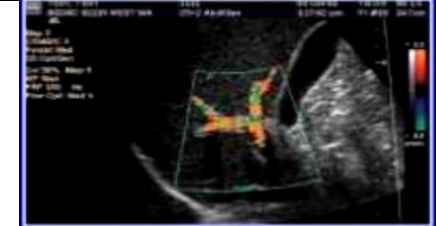- o **PRF** " : Decrease → detect lower velocities "
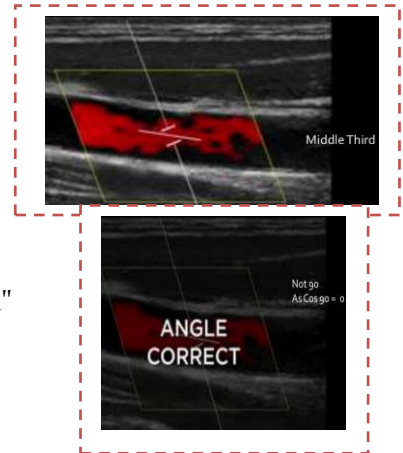
↘ **ALIASING** = Signal disturbed → Non Homogenous color flow

↘ **How to Compensate Aliasing ?** **by** :

- o <u>Increase PRF</u> "Pulse Repeated Frequency" / If use **max PRF** , then :

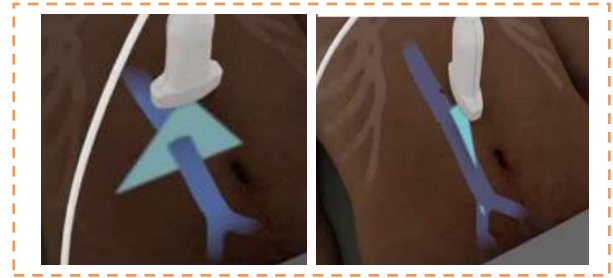|	
o Decrease Depth	o Lower Frequency
o Shift base line	o Increase Angle "with in limits"

↘ **COLOR VELOCITY SCALE** : Increase it = adjust setting to detect higher velocities , so Ex.

High CVS 69 Cm/Sec	CVS 30 Cm/Sec	CVS 2 Cm/Sec
↘ Apparent absent PV Flow	↘ Detect Normal PV Flow	↘ Disturbed PV Flow "**Aliasing**"

SUMMARY OF DOPPLER PARAMETERS

↘ Directions of Scan :

- ○ At least 2 directions
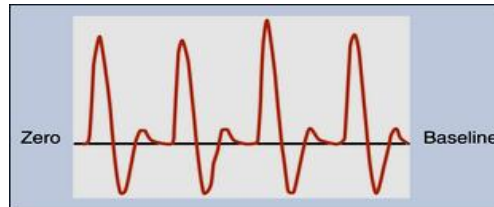
  Vertical & Horizontal +/- Oblique

PATTERNS OF FLOW

TRIPHASIC	BIPHASIC	MONOPHASIC
•**3 stages**: Rapid forward → Slow back word → slow forward. •Flow in **peripheral artery** = " *Flow with peripheral resistance* "	*2 Stages* *RAPID FOWRWARD → SLOW FORWARD* • *Flow in central arteries* = "*Low resistance flow*"	= SYSTOLIC FLOW & STOP IN DIASTOLE • MOSTLY ABNORMAL **NORMAL IN MCA 1ST TRIMESTER**

Base line = Zero Line / Every side of it = Different Direction

"Forward & Backward

	ARTERIAL	VENOUS	
Triphasic	Limbs - Aorta	↘ IJV , Brachiocephalic ▪ Hepatic Veins	**Triphasic**
Biphasic	CCA - ICA & ECA "Visceral "Celiac - SMA – Renal …etc	▪Limbs ▪Portal Vein	**Continuous with minimal fluctuation**
Monophasic	"in adult "Abnormal = *Intrauterine "MCA" in 1ˢᵗ trimester*	▪Others ………….	

TERMS :

- ○ **PSV :** Peak Systolic Velocity
- ○ **EDV :** End Diastolic Velocity
- ○ **PRF :** Pulse Repeated Frequency

- ○ **SD RATIO :** Systoilc Diastolic Ratio
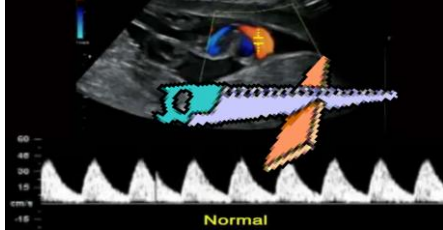- ○ **RI :** Resistive Index
- ○ **PI** : Pulstility Index

PARAMETERS

↘ UMBILICAL ARTERY

Normal Pattern

SAW TOOTH "Biphasic"
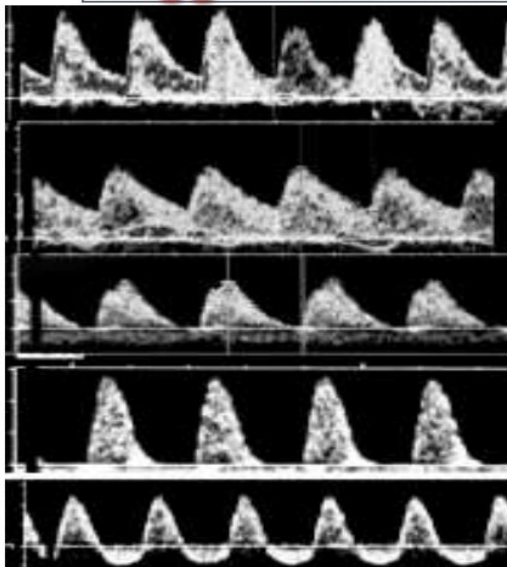

Indices Summary

"upper limit" *Rough measures*

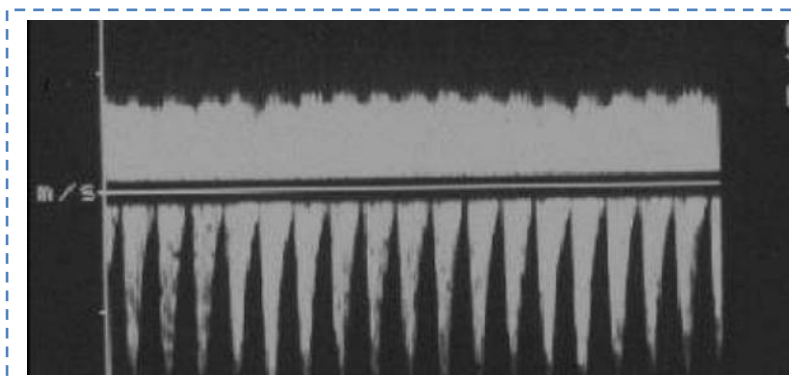| Age w	SD	PI	RI
20	< 6	1.5	0.85
25	< 5	1.4	0.80
30	4	1.3	0.75
35	< 3.5	<1.2	0.70
40	< 3.2	1.08	< 0.60

Doppler Flow Velocity in Umbilical A.

(A) Normal umbilical artery at <u>18 weeks</u> shows <u>relatively high resistance</u>, but consistent diastolic flow.

(B) Normal umbilical artery at <u>36 weeks</u>, <u>low resistance</u>, generous diastolic flow.

(C) High resistance, diastolic velocity low.

(D) *Absent* end-diastolic velocity (AEDV).

(E) *Reversed* diastolic velocity (REDV) in severe intrauterine growth restriction (IUGR).
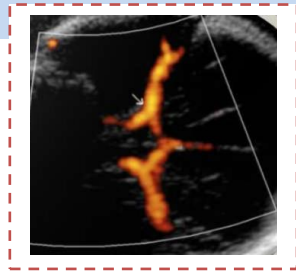
↘ UMBILICAL VEIN

○ Normally Continuous non fluctuation flow

○ Pulsating flow occurs in Placental insufficiency + arterial flow changes
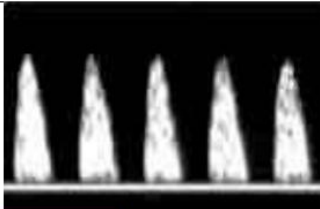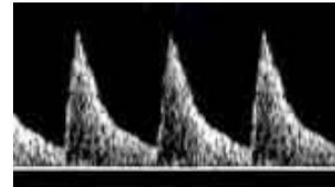
↘ MCA Middle Cerebral A. :

- ○ Can use ANGLE = 0 / * COS 0 = 1 → Best Doppler signal
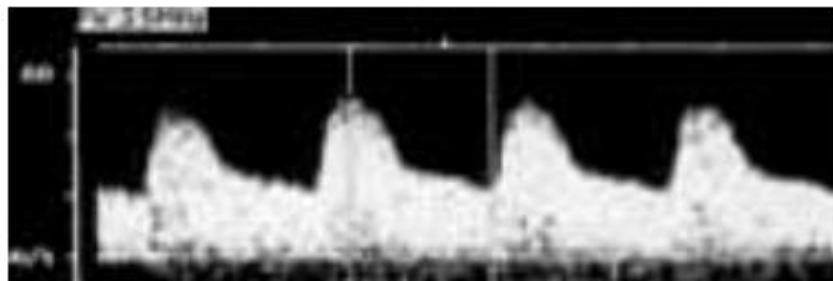- ○ IN Placental insufficiency → less blood reach brain

→ MCA vasodilatation → Decrease resistance. *"Brain sparing effect"*

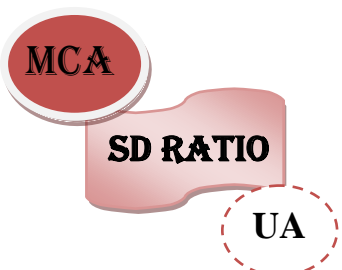

Normal flow of the Middle Cerebral Artery in 1º trimester

Normal flow of the Middle Cerebral Artery in 2º and 3º trimester

'*Brain sparing*'

MCA - **lower peak, much higher diastolic velocity** suggests cerebro-vasodilation

MCA

SD RATIO

UA

↘ KEEP IN MIND   Normal   **SD Ratio**

of **MCA** > always higher than > *Umbilical A.*

U.A. S/D ratio

Age w	SD
20	< 6
25	< 5
30	4
35	< 3.5
40	< 3.2

S/D ratio

MCA > UA

↘ CAROTID Aɾ. :

PARAMETERS / Artery		PSV cm/sec	EDV cm/sec	RI
E.C.A				
I C A	N	47–73	13–21	0.64 : 0.80
	A	62–90	23–37	0.54 : 0.66
CCA	A	78 :118	20–32	0.84 : 0.72
Vertebral Artery	N	27 - 57	5 : 11	0.73 : 0.89
	A	40 : 60	14–22	0.58 : 0.73
Anterior cerebral A.	N	12–35	6–20	0.60–0.80
M.C.A.	N	20–70	8–20	0.60–0.80
Basilar	N	30–80	5–20	0.60–0.80

ICA	ECA	CCA
PSV: 45 – 125 cm/sec Difference between 2 sides < 15 cm/sec		
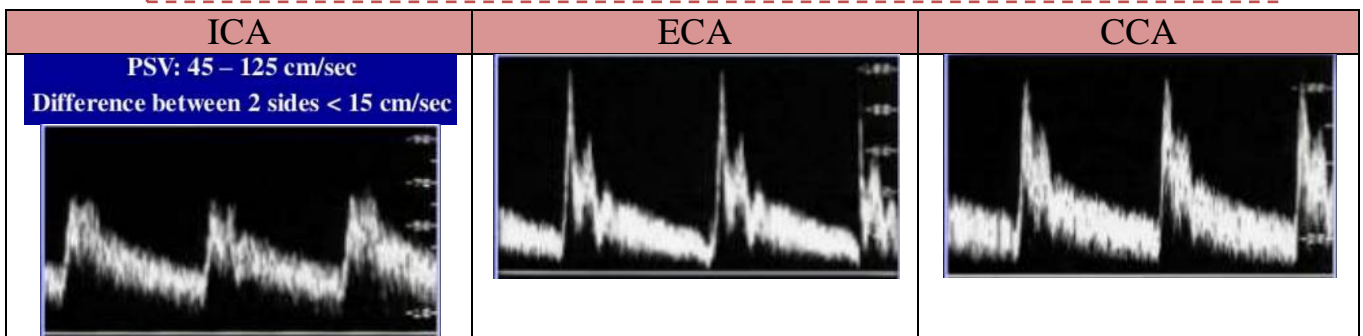
↘ HEPATIC A & PORTAL V. :

BOTH HEPATIC A. & PORTAL V. → FLOW DIRECTION TOWARD LIVER

Flow Toward Probe

Flow Away Probe

Figure 2.26 Normal portal vein waveform. Respiratory modulations are evident.

PV

PEAK VELOCITY

20 : 33 CM / SEC

HEPATIC V

A	Atrial systole
S	Ventricular systole
D	Atrial diastole

S wave > D wave

Commonly described as triphasic

Hepatic artery – normal Biphasic low resistance flow
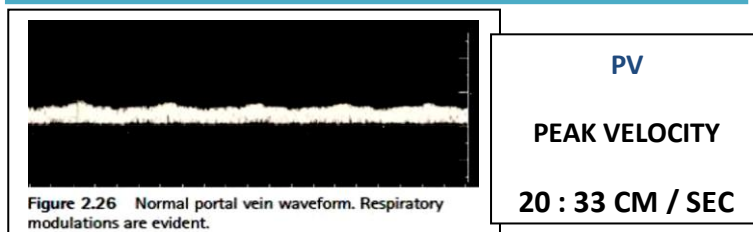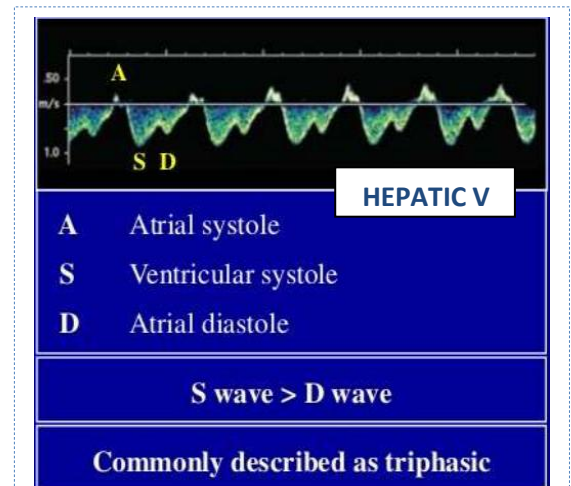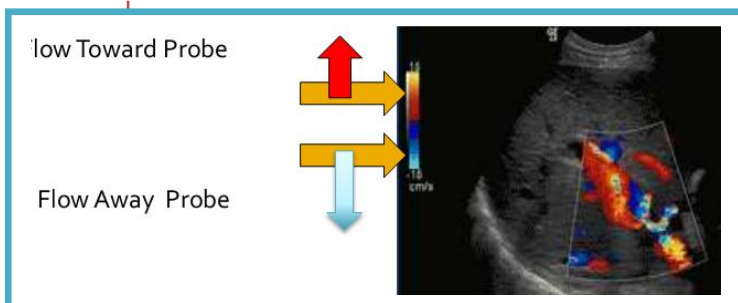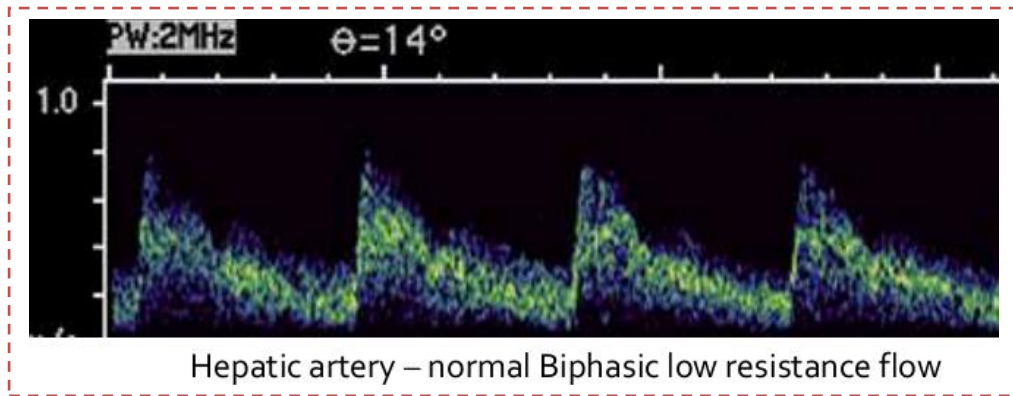
↘ RENAL A :

- – low resistance
- – R I is < 0.7
- – ESP (Early systolic peak) present
- Rapid acceleration to peak systole (< .07s)

|	
PVS < 180 cm/sec	normal test
PVS < 180 cm/sec	non-graduated stenosis
PSV > 180 cm/sec & RAR < 3.5	stenosis < 60%
PSV > 180 cm/sec & RAR > 3.5	stenosis > 60%
No renal artery flow & kidney < 9.0 cm	occlusion

PSV- peak systolic velocity; RAR renal-aortic ratio.

↘ UPPER LIMB AS. :

		PSV
Subclav. A	Child	<105 Cm/Sec
	Adult	105
Axillary A.	C	<80
	A	80
Brachial A	C	<60
	A	60
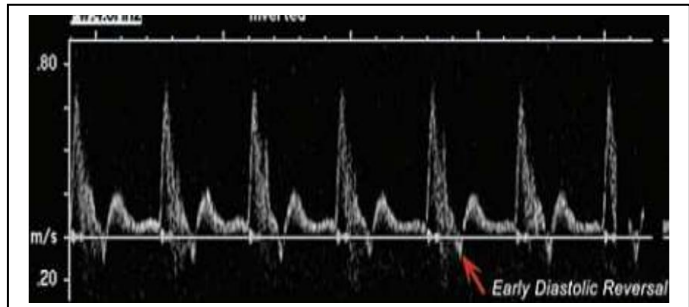
↘ LOWER LIMB AS. :

		PSV
CFA	A	100 Cm/sec
SFA	A	80–90
Popl. A.	A	70
Tibeo-peroeal	A	40 –50
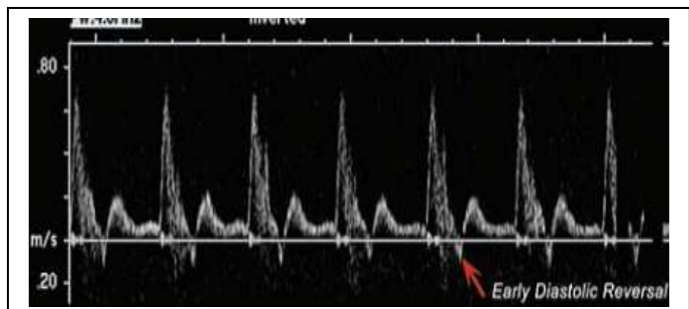
↘ **TESTICULAR AS. :**

PSV	EDV	RI	PI
4.0–19.5	1.6–6.9	0.48–0.75	0.7–2.3

NB. Younger Age → Higher RI
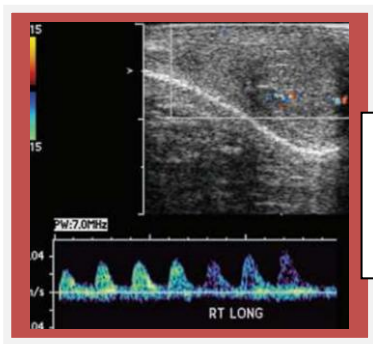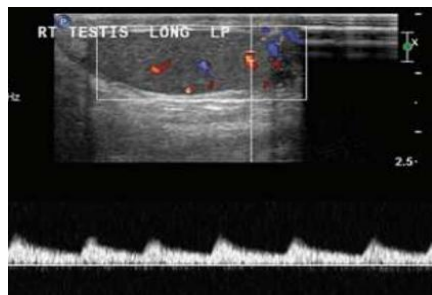
- Waveform obtained in a 2-month-old boy
- testicular volume of 0.7 Cm
- shows higher resistance **"Higher RI"**

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