VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

1.2.2

Add-on Certificates Details with Report

Index

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

Department of Physiology

Velammal Medical College Hospital and Research Institute

Madurai

VMCH/Physio/CC/2021/01

CIRCULAR

To First MBBS students of 2020-21 batch

12.2.2021

There will be a certificate course on **Circadian rhythm – in depth** for first MBBS students from 9am to 4pm on Friday, 19-2-2021. All the students are expected to attend the course without fail.

Date: Friday, 19th February 2021

Time: 9am to 4pm

Venue: Lecture Hall 1, Velammal Medical College

Dr.S.Anu

Professor and Head

Department of Physiology

Departments of Physiology
Velammal Medical College Hospital and RI
Madurai

invite you for

Certificate course in

CIRCADIAN RHYTHM IN DEPTH

PATRON

Shri.M.V.Muthuramalingam, Chairman, Velammal Educational Trust

ADVISORS

Dr.T.Thirunavukkarasu
Dean

Dr.P.K.Mohanty
Vice Principal

Organising Secretary
Dr.S.Anu, Professor and Head,
Department of Physiology

19 February 2021 • 9:00 am onwards

For First MBBS Students of 2020-21 batch

Venue

Lecture Hall 1, Velammal Medical College

Course Objective

At the conclusion of this activity, the learner (first MBBS student) will be better able to:

- Identifying the physiology of biological clock
- Circadian rhythm examples and practical applications
- Applied aspects of biological clocks

AGENDA

9.00 am	Introduction to Circadian rhythm
	By Dr.S.Anu, Professor and Head, Physiology
10 am	Physiological basis of chronobiology
	By Dr.M.Shanthi, Professor
11.00 am	Break
11.15 am	Synchronization of Circadian rhythms
	By Dr.K.Rekha, Associate Professor
1 pm	Lunch break
2 pm	Molecular mechanisms and underlying circuits
	By Dr.M.Saravanan, Associate Professor
3 pm	Applied aspects
	By Dr.S.P.Kausikan, Post graduate
3.45 pm	Vote of thanks
	By Dr.John Rajpathy, Professor
4 pm	Conclusion

Circadian Rhythms

Many of our biological and behavioral functions experience variations throughout the day, including: sleep, body temperature, alertness levels and mental and physical performances. Many of these functions vary systematically in a cycle of about 24 hours and are called "circadian rhythms" (from the Latin words "circa" which means "about" and "dies" which means "a day"). These circadian variations are governed by a biological clock located in the brain. Crewmembers who work abnormal schedules often experience “shift-lag syndrome,” which is characterized by such symptoms as feelings of fatigue, sleepiness, insomnia, disorientation, digestive trouble, irritability, reduced mental agility and reduced performance efficiency. Similar symptoms labeled “jet-lag syndrome” are often experienced by crew members after transmeridian flights.

The mechanism underlying circadian rhythms is called the “biological clock” or the “circadian clock.” Research has shown that the biological clock is located in the suprachiasmatic nucleus[1] of the hypothalamus (a gland). The biological clock is probably the result of human evolutionary adaptation to the solar day.

Laboratory studies have shown that, in the absence of any time cues (i.e., no sunlight or social time cues), the biological clock for most humans operates on a cycle of about 25 hours. Under ordinary circumstances, however, the

biological clock is reset by about one hour each day such that the biological clock is synchronized with the 24-hour solar day. The cues that serve to reset the biological clock are called “zeitgebers,” a German word that means “time givers.” Evidence supports morning sunlight as the most important zeitgeber. Other cues in the social environment that serve as zeitgebers have not been identified with any amount of certainty. However, cues that may serve as zeitgebers include work/sleep schedule, eating schedule, social activities and, in the absence of other cues, subtle environmental factors such as building vibration and traffic noise.

Many laboratory studies have demonstrated circadian variations in biological functions such as body temperature, cell division and hormone secretion. Also, both laboratory studies and field studies have demonstrated variations related to circadian rhythms in behavioral functions such as alertness, reaction time, short-term memory, long-term memory, search tasks, vigilance and sleep. The circadian variation throughout a normal solar day is not the same for all biological and behavioral functions. There are, however, general trends in certain bodily functions/parameters likely related to circadian relations. The body temperatures of individuals adapted to local time and to a normal work/sleep cycle (i.e., sleep at night) vary systematically with circadian rhythms. Body temperature is lowest during the early morning hours from about 2 am to 6 am and starts to rise from this low point at about the normal waking hour. Thereafter, body temperature tends to rise until late afternoon or early evening, at which point it starts a decline that continues until it

reaches its low point in the early morning hours. The circadian variation in body temperature is virtually the same for active and non-active individuals. It has been suggested that body temperature is an indicator of the body's readiness to perform work.

Circadian variations in work efficiency are not the same for all tasks. Also, under a normal work/sleep schedule and complete adaptation to the local solar day, performance efficiency does not remain the same throughout the day. For many tasks, performance efficiency tends to increase from the normal wake-up time in the morning to a peak in the early or late afternoon. Performance efficiency on some tasks shows a temporary decline following lunch time, even if a meal is not eaten. It is important to point out that work efficiency in these studies was tested periodically (and briefly) throughout the day (about 8 am through 9 pm), so fatigue was not a factor affecting performance. Performance efficiency tends to decline to a low point in the early morning hours (2-6 am). The important implication of this research is that circadian rhythms influence performance efficiency even when the circadian variations are in synchrony with the solar day and the normal work/sleep schedule.

The effects of circadian rhythms on safety are difficult to assess because they are virtually always confounded with other contributory factors. However, the following findings suggest that the effects of circadian rhythms are, in part, responsible for:

- The number of motor vehicle accidents on roadways peaks between 2 am and 6 am and again around 3 pm. These are the times of maximum sleepiness due to circadian rhythms
- Risk of injury is 30 percent higher during night shifts than during day shifts, and the difference increases over successive night shifts until the difference reaches a high of 39 percent increased risk of injury on the fourth night.

Research also has demonstrated that a host of problems occur when circadian rhythms are not in synchrony with the work/sleep schedule imposed by a person's job. Such asynchrony can result from a change in work schedule, transmeridian flight, or a combination of the two. Such asynchrony is important for two reasons. First, the job may require an individual to perform work at a phase during the circadian cycle when performance efficiency is low. Second, disrupting the normal work/sleep schedule decreases the amount and quality of sleep, which leads to fatigue.

Department of Physiology
Velammal Medical College Hospital and Research Institute
Madurai
Report

Topic:	**Certificate course on Circadian Rhythm in Depth**
Date:	**19-2-2021**
Venue:	**Lecture Hall 1, Velammal Medical College**
Target Audience:	**First MBBS students 2020-2021 batch**
Number of participants:	**146**

Report:

An certificate course on Circadian Rhythm in Depth was organized by the Department of Physiology, Velammal Medical College Hospital and Research Institute, Madurai, Tamilnadu for first MBBS students 2020-21 batch on 19.02.2021 from 9 am to 4 pm.

The program began with the welcome address and Introduction to Circadian rhythm by Dr.S.Anu, Professor and Head, Department of Physiology, Velammal Medical College, Madurai. After this session, Physiological basis of chronobiology, Synchronization of Circadian rhythms, Molecular mechanisms and underlying circuits and Applied aspects were discussed to the students by the faculty of Department of Physiology. The program concluded with Vote of thanks by Dr.John Rajpathy, Professor, Department of Physiology.

Outcome:

Students got benefitted by knowing about Identifying the physiology of biological clock, Circadian rhythm examples and applications, Applied aspects of biological clocks.

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

Department of Physiology

Velammal Medical College Hospital and Research Institute

Madurai

VMCH/Physio/CC/2021/02

CIRCULAR

To First MBBS students of 2020-21 batch

1.3.2021

There will be a certificate course on **Environmental Physiology** for first MBBS students from 9am to 4pm on Monday, 8-3-2021. All the students are expected to attend the course without fail.

Date: Monday, 8th March 2021

Time: 9am to 4pm

Venue: Lecture Hall 1, Velammal Medical College

Dr.S.Anu

Professor and Head

Department of Physiology

Departments of Physiology
Velammal Medical College Hospital and RI
Madurai

invite you for

Certificate course in

ENVIRONMENTAL PHYSIOLOGY

PATRON

Shri.M.V.Muthuramalingam, Chairman, Velammal Educational Trust

ADVISORS

Dr.T.Thirunavukkarasu
Dean

Dr.P.K.Mohanty
Vice Principal

Organising Secretary
Dr.S.Anu, Professor and Head,
Department of Physiology

8 March 2021 • 9:00 am onwards

For First MBBS Students of 2020-21 batch

Venue

Lecture Hall 1, Velammal Medical College

Course Objective

At the conclusion of this activity, the learner (first MBBS student) will be better able to:

- understand the environmental influence on human physiology
- apply the physiology to situations with detail and precision

AGENDA

9.00 am	Introduction to Environmental Physiology
	By Dr.S.Anu, Professor and Head, Physiology
10 am	Temperature homeostasis
	By Dr.K.Rekha, Associate Professor
11.00 am	Break
11.15 am	Hydration, Dehydration, Humitidy
	By Dr.M.Saravanan, Associate Professor
1 pm	Lunch break
2 pm	Altitude physiology and acclimatisation
	By Dr.M.Shanthi, Professor
3 pm	Medical problems and handling them
	By Dr.S.P.Kausikan, Post graduate
3.45 pm	Vote of thanks
	By Dr.John Rajpathy, Professor
4 pm	Conclusion

Department of Physiology
Velammal Medical College Hospital and Research Institute
Madurai
Report

Topic:	**Certificate course on Environmental Physiology**
Date:	**18-3-2021**
Venue:	**Lecture Hall 1, Velammal Medical College**
Target Audience:	**First MBBS students 2020-2021 batch**
Number of participants:	**148**

Report:

An certificate course on Environmental Physiology was organized by the Department of Physiology, Velammal Medical College Hospital and Research Institute, Madurai, Tamilnadu for first MBBS students 2020-21 batch on 18.03.2021 from 9 am to 4 pm.

The program began with the welcome address and Introduction to topic by Dr.S.Anu, Professor and Head, Department of Physiology, Velammal Medical College, Madurai. After this session, Temperature homeostasis, Hydration – Dehydration – Humidity, Altitude physiology and acclimatisation, Medical problems and handling them were discussed to the students by the faculty of Department of Physiology. The program concluded with Vote of thanks by Dr.John Rajpathy, Professor, Department of Physiology.

Outcome:

Students got benefitted by knowing about understanding the environmental influence on human physiology and applying the physiology to situations with detail and precision.

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

Velammal Medical College Hospital and Research Institute

Ref. No: VMCHRI/BIOCHEM/CC-7 Date: 05.04.2021

CIRCULAR

To

All Doctors

Certificate Course on POCT (Point of Care Testing)

Department of Biochemistry is organizing a certificate course on POCT (Point of Care Testing) on 29.04.2021 (Thursday) between at 9.00 AM to 3.00 PM.

All Faculties are invited.

VICE PRINCIPAL

Dr. P.K. MOHANTY
Vice Principal
Velammal Medical College Hospital
and Research Institute
Madurai-625 009

Copy submitted to:

The Hon. Chairman

Copy to:

The Dean

Medical Superintendent

Chief Administration Officer

HOD, Biochemistry

All Clinical and Non-Clinical HODs

Velammal Medical College Hospital & Research Institute

Anuppanadi, Madurai - 625009

Department of Biochemistry

Certificate course on

POCT (Point of care testing)

Venue: Biochemistry Demonstration Room

Date: 29.04.2021

For First year M.B.B.S., students

PATRON

Chairman: Shri.M.V.Muthuramalingam

Advisors:

Dean: Dr.R.M. Raja Muthaiah

MS: Dr. Somasundarm

DR.A.Hariharan
Course coordinator
Biochemistry

DR.P.K.Mohanty
Vice Principal
Prof. HOD Biochemistry

Objective: Should be able to perform capillary blood glucose, urine pregnancy testing and troponin I and should be able to interpret to report.

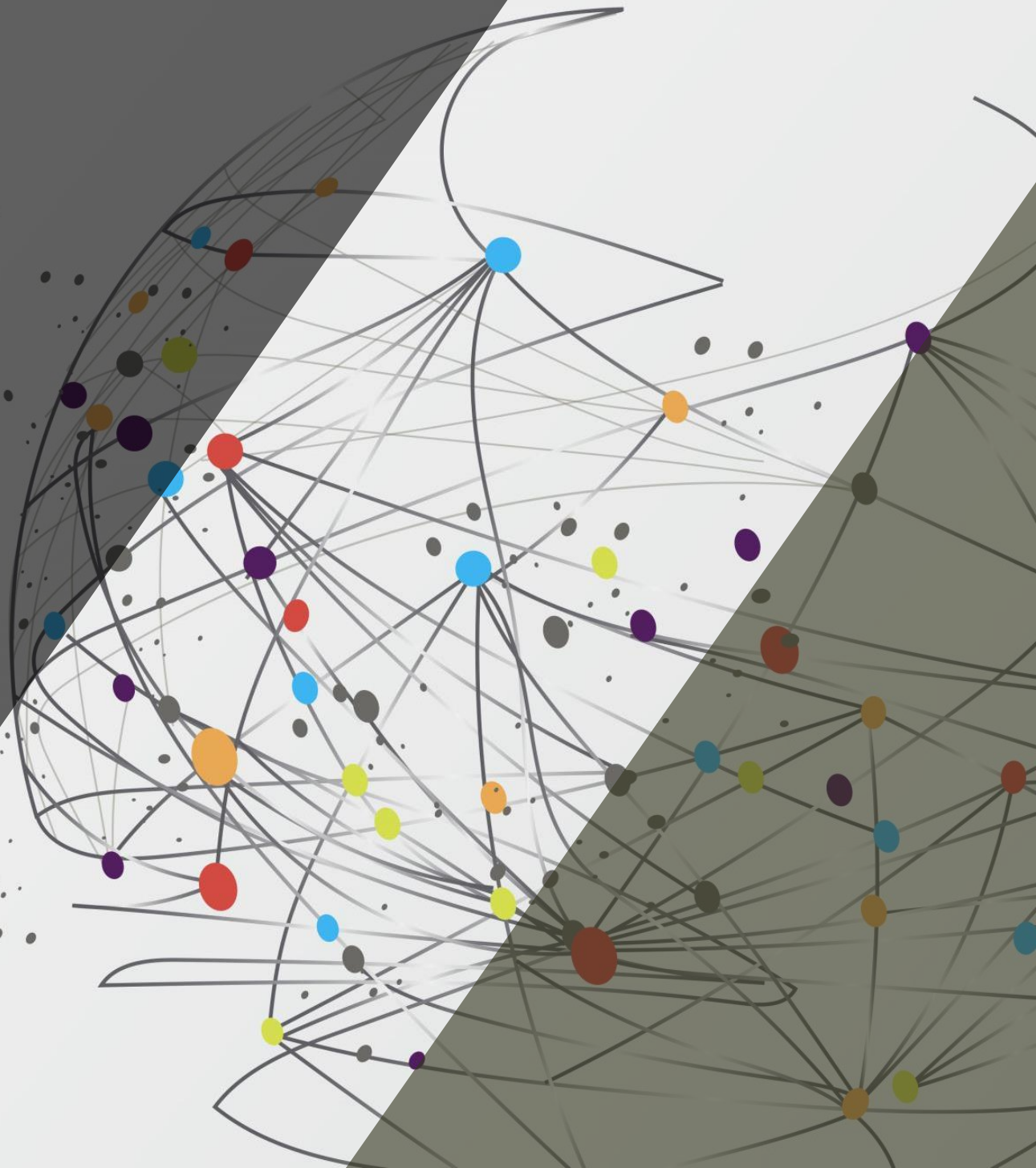
Teaching Method: Lecture and demonstration

For further detail contact:
DR.A.Hariharan
Mobile No. 97898784256

Agenda

Time	Topic	Speaker
09.00 – 09.15 AM	Welcome address	DR.P.K.Mohanty
09.15 - 09.45 AM	Pre test	DR.A.Hariharan
09.45 – 11.00 AM	POCT – Basics	DR.A.Hariharan
11.00 AM – 1.00 PM	Demonstration: POCT	DR.A.Hariharan & Resource persons
1.00- 2.00 PM	LUNCH	
2.00- 2.30 PM	Post test	`DR.A.Hariharan
2.30- 3.00 PM	Feedback and Valediction	DR.P.K.Mohanty

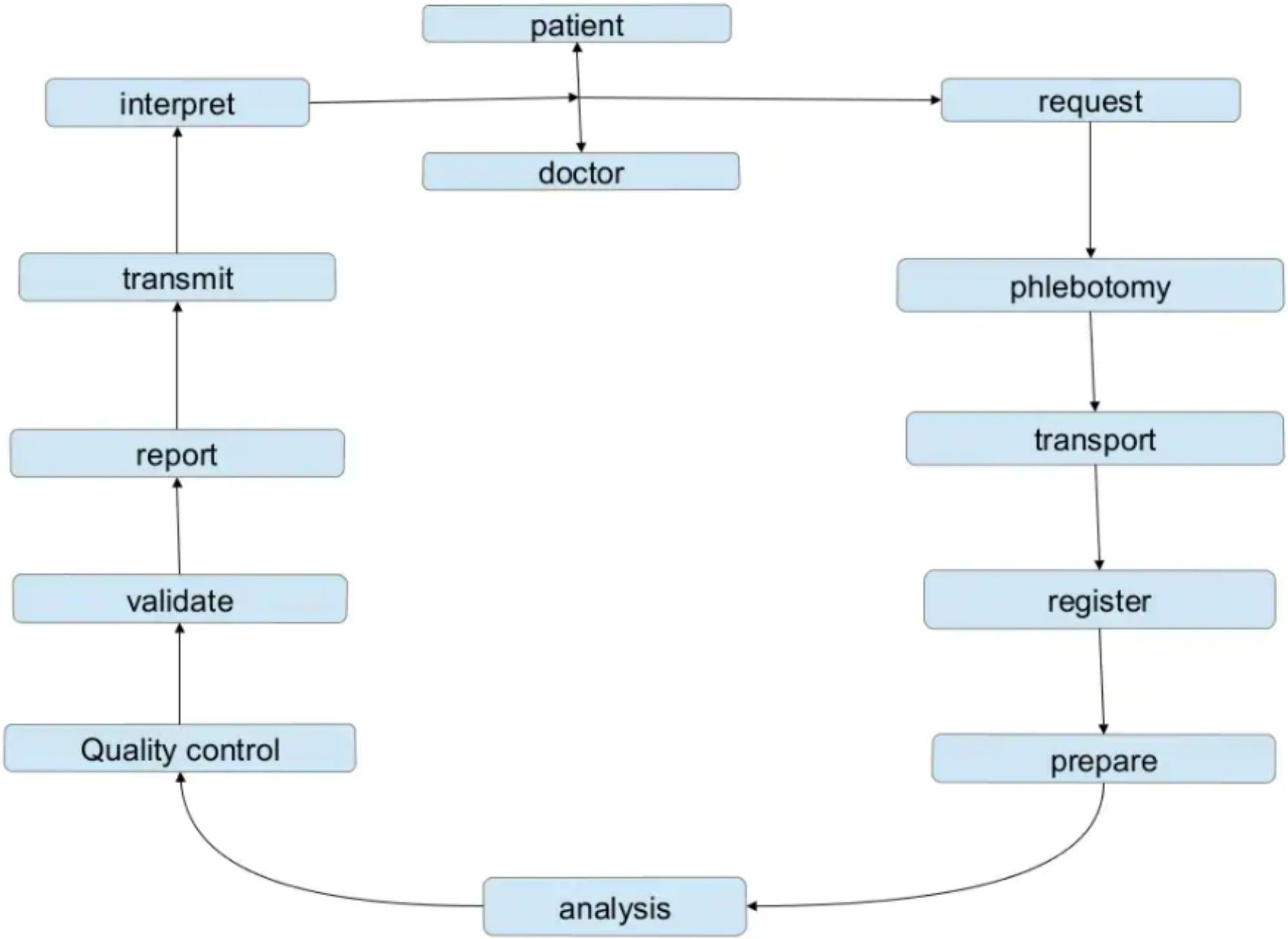
POINT OF CARE TESTING (POCT)



-DR.A.Hariharan M.D,
(Biochemistry)

Definition

When a test is performed at a time at which test results enables a decision to be made and an action taken. That leads to an improved health outcome.


patient
interpret
request
doctor
transmit
phlebotomy
report
transport
validate
register
Quality control
prepare
analysis

Advantages

Reduced turn around time

Improved patient morbidity & mortality
Reduction in hospital admission

Improved interaction between patient and carer

Reduction in clinical visits

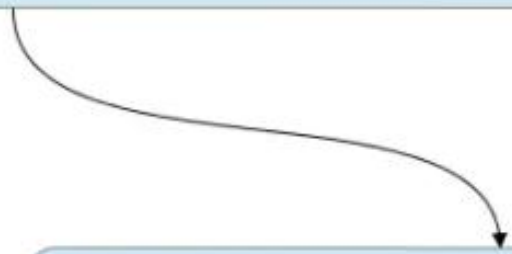
Improved cost of care

Reduction in administrative work associated With test requesting & reporting

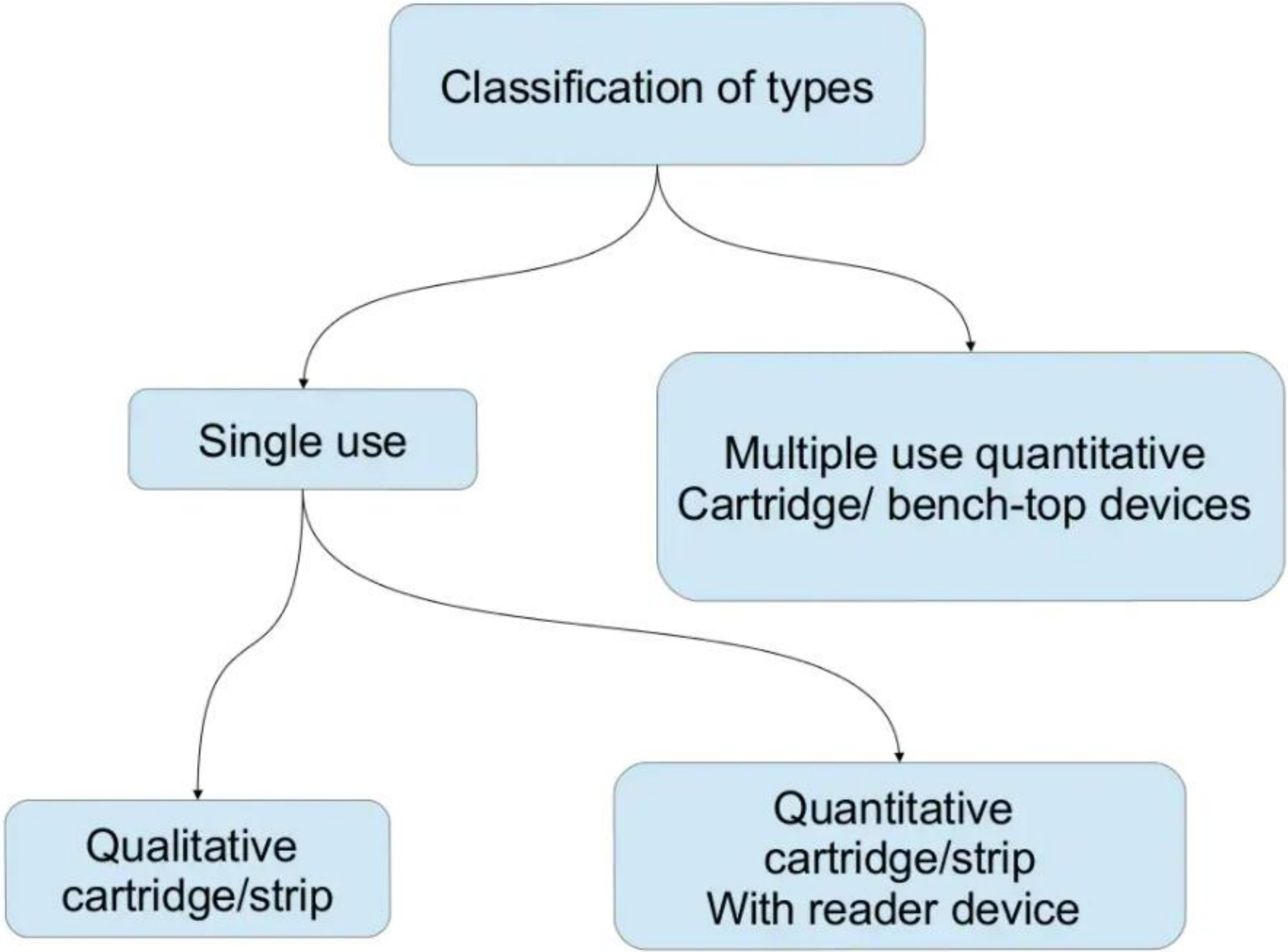
Disadvantages

Increase in administrative work associated with training and Certification of operators

Caregivers required to perform test



Increased risk of errors


Classification of types
Single use
Multiple use quantitative
Cartridge/ bench-top devices
Qualitative
cartridge/strip
Quantitative
cartridge/strip
With reader device

Analytical Principle

- Reflectance
- Lateral flow or flow through immunoassays
- Electrochemistry
- Electrical impedance

Reflectance

e.g.

Urine and blood dipsticks for glucose and various other analytes.

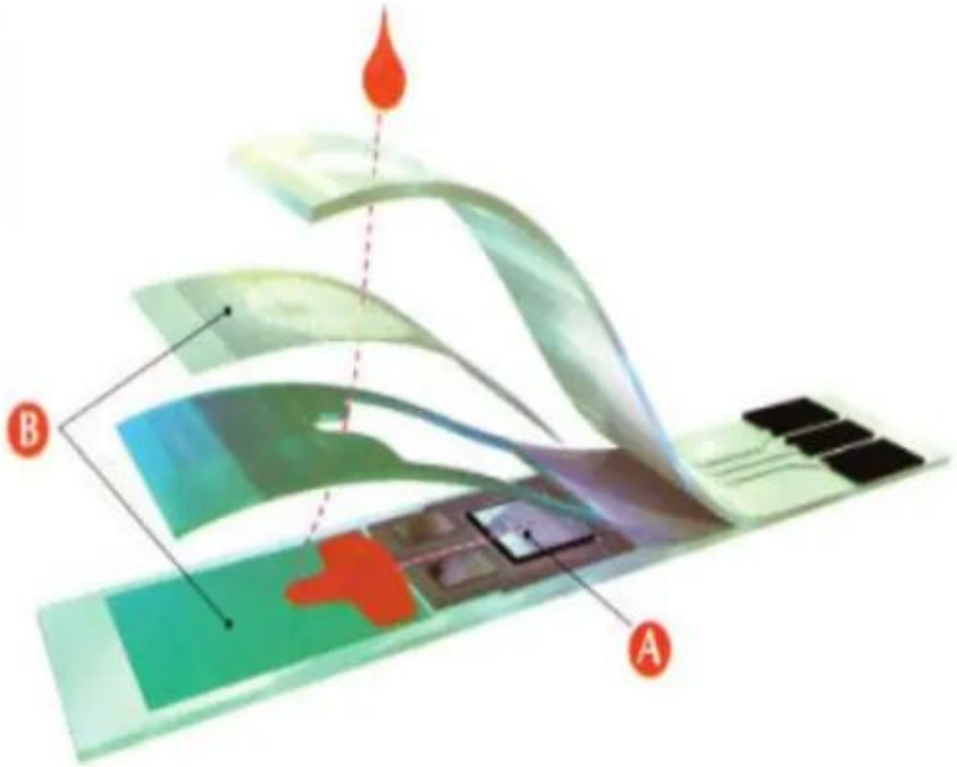
Electrochemistry

Strip device

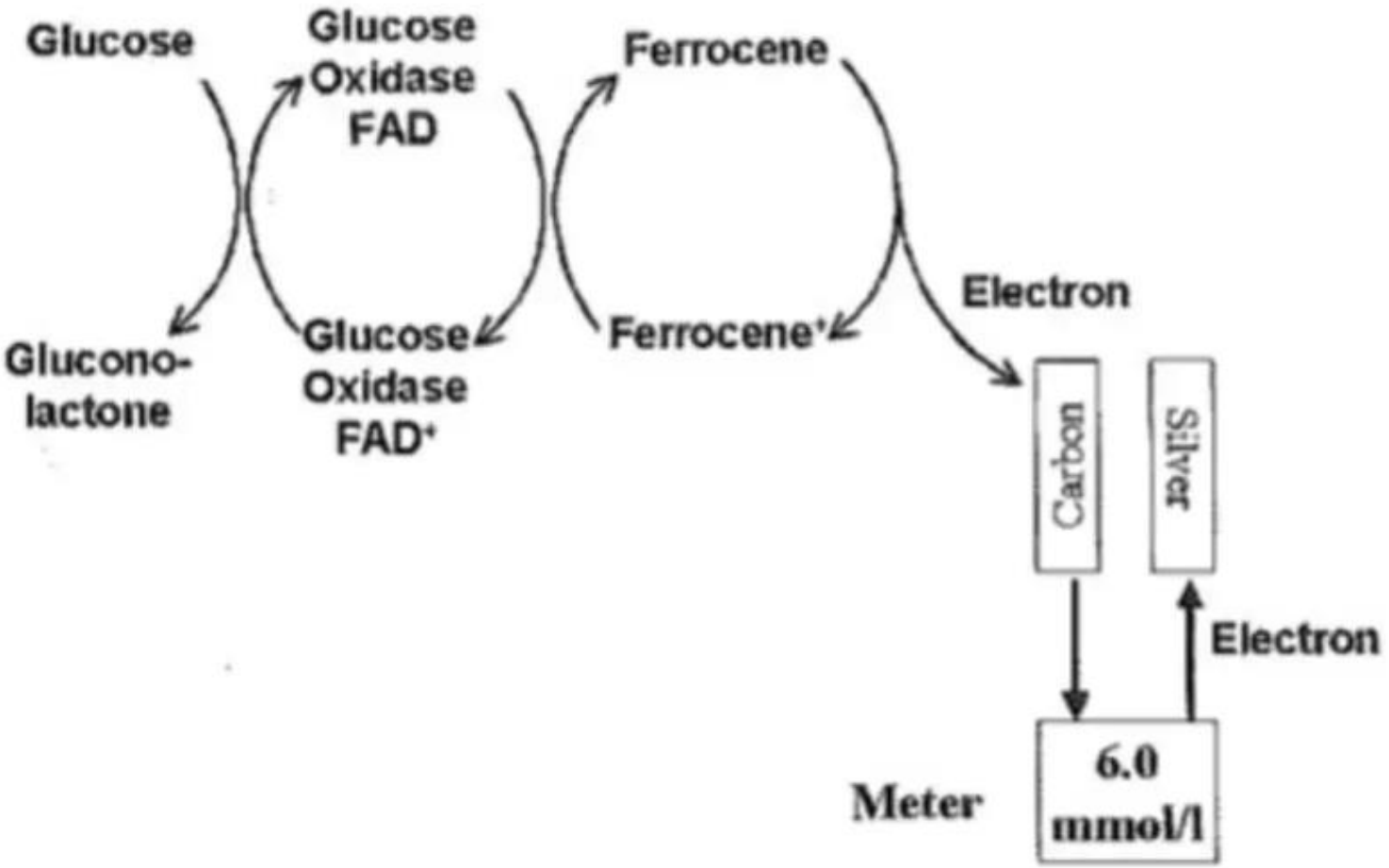
Cassette and bench-top device

Glucose strip

A. Electrode sensors
B. Separating layer



Principle of Electrochemical Glucose strip



Glucose meter

A negative voltage of –0.4 V is applied at the reference electrode.
When blood or a glucose solution is placed in the strip, a chemical reaction occurs inside it, generating a small electrical current proportional to the glucose concentration

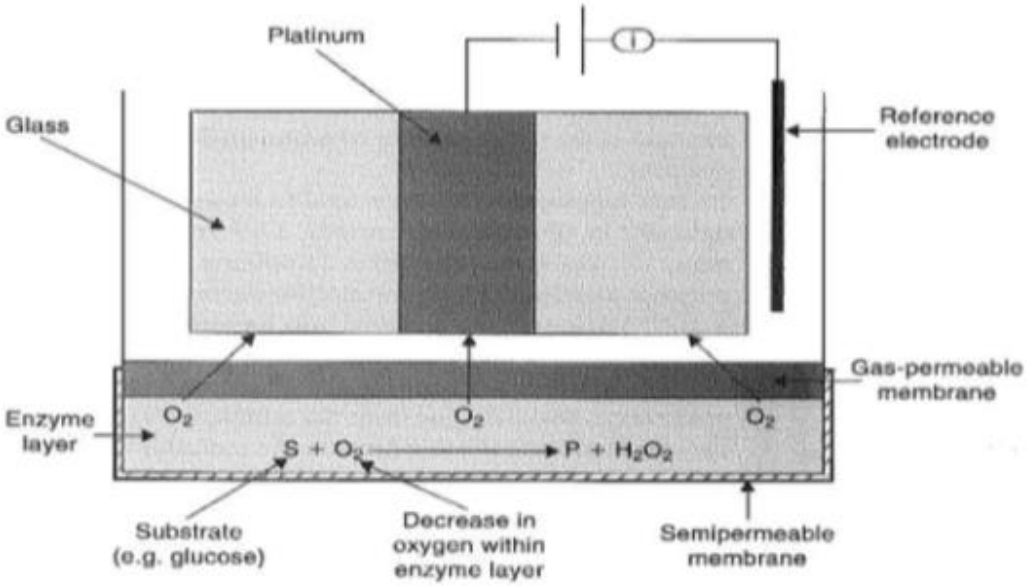
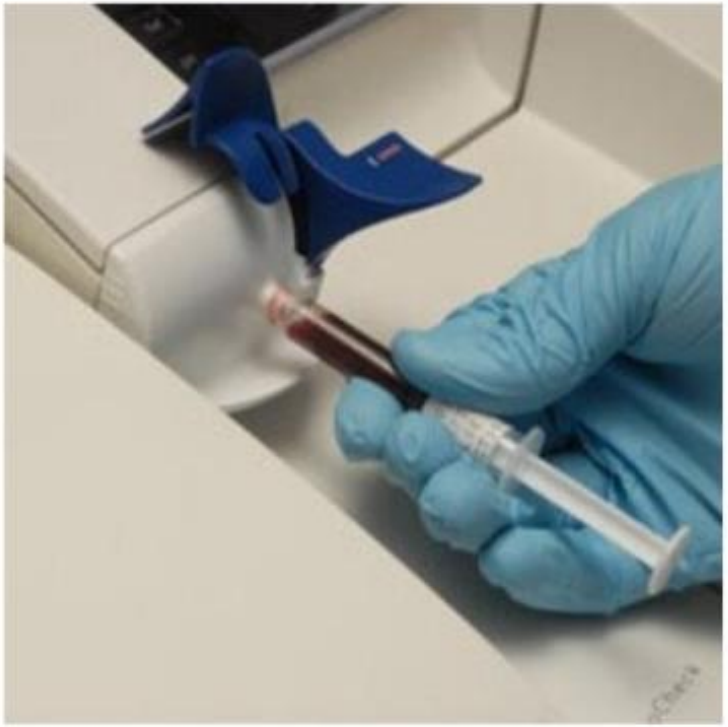


Figure 4-11 Illustration of enzyme electrode prepared using oxidase enzyme immobilized at the surface of amperometric PO_2 sensor. Increase in substrate concentration S reduces the amount of oxygen present at the surface of the sensor.

Bench-top Devise



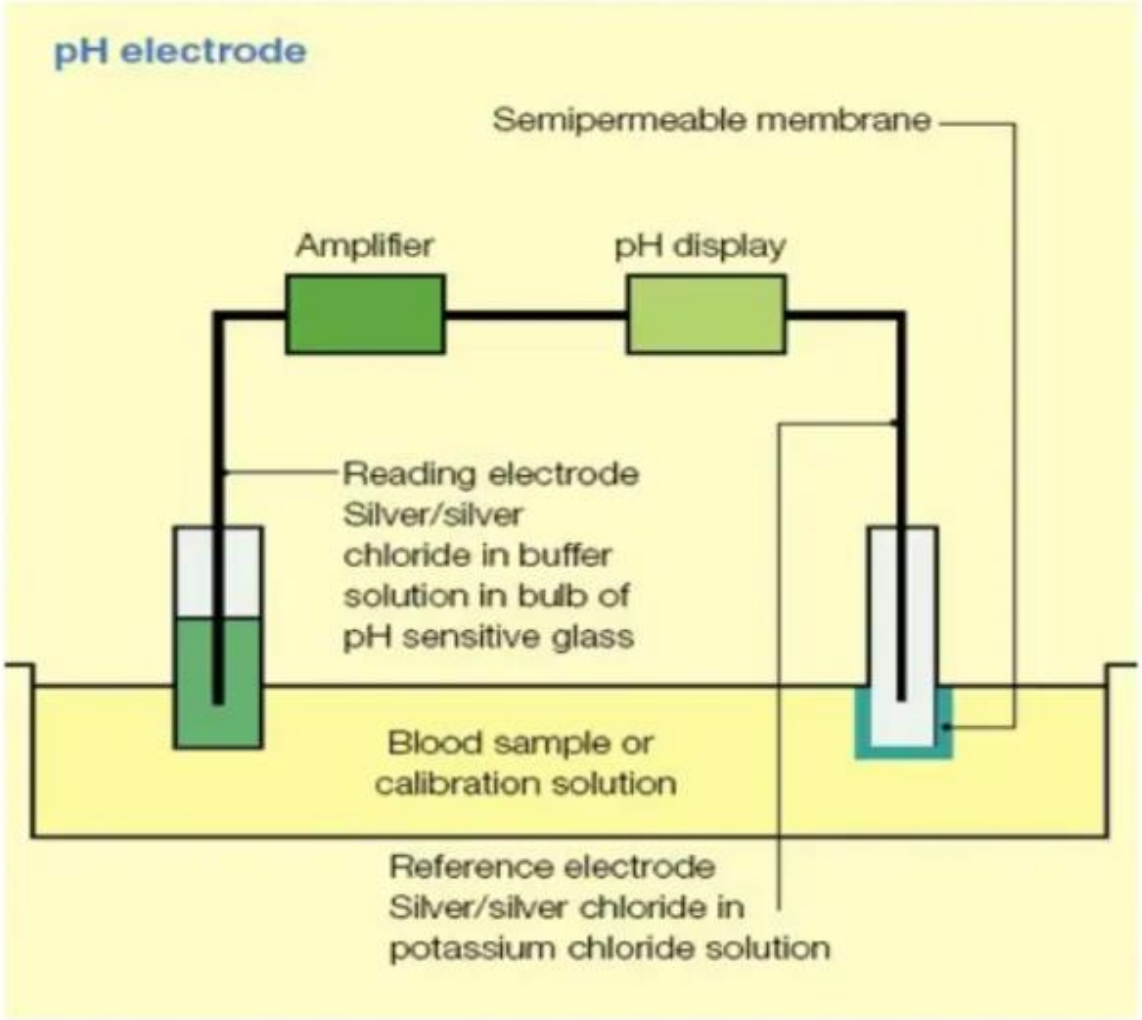
Principle

Measurement of

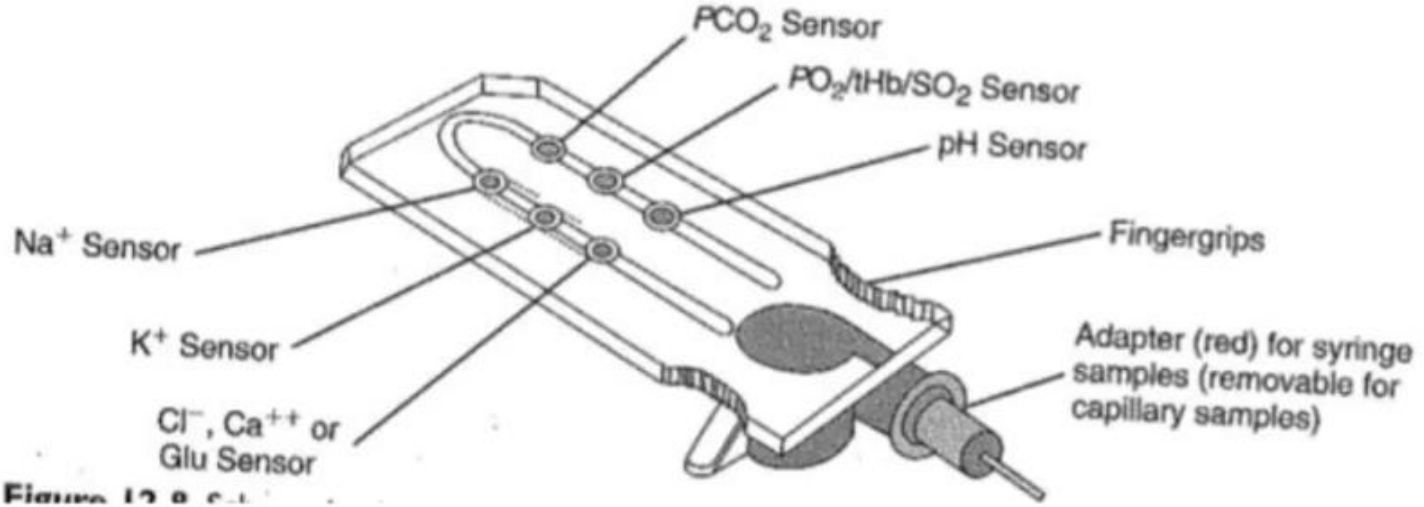
PH, PCO2, PO2,

Electrolyte, Glucose,

Lactate.



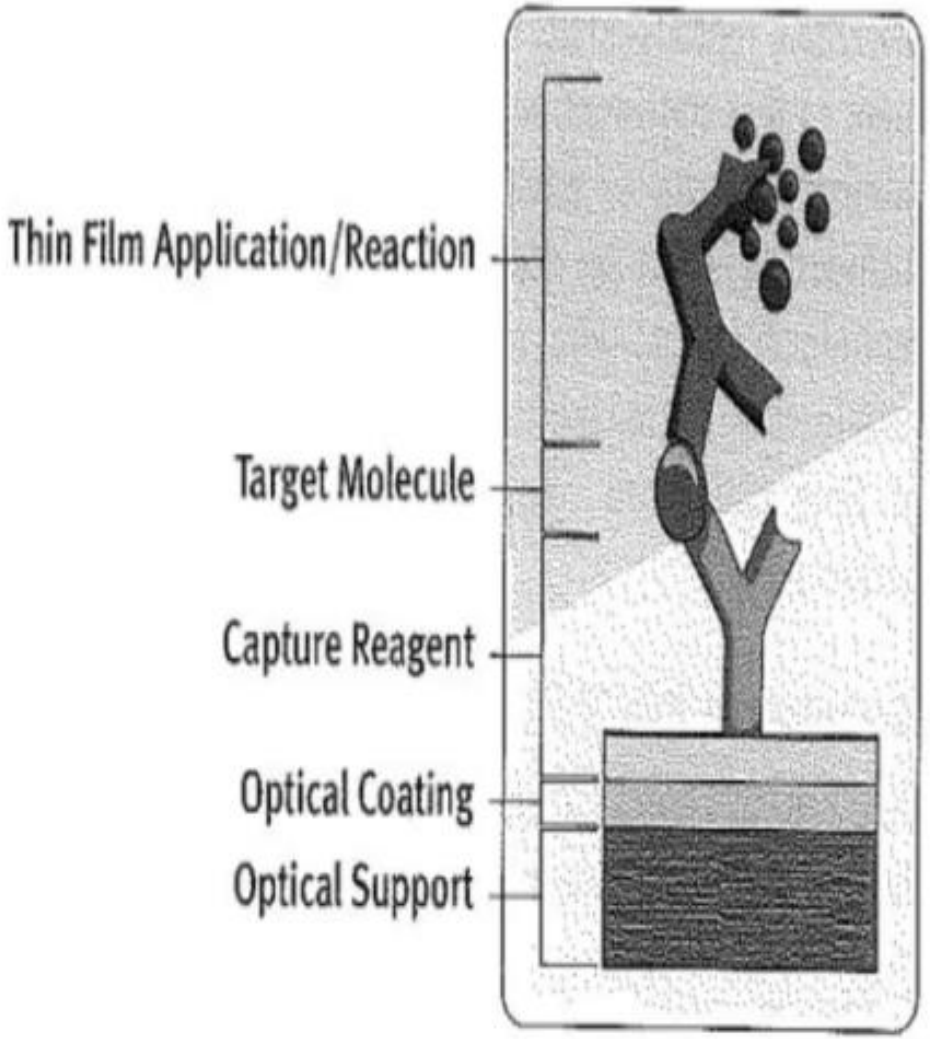
Cassette device

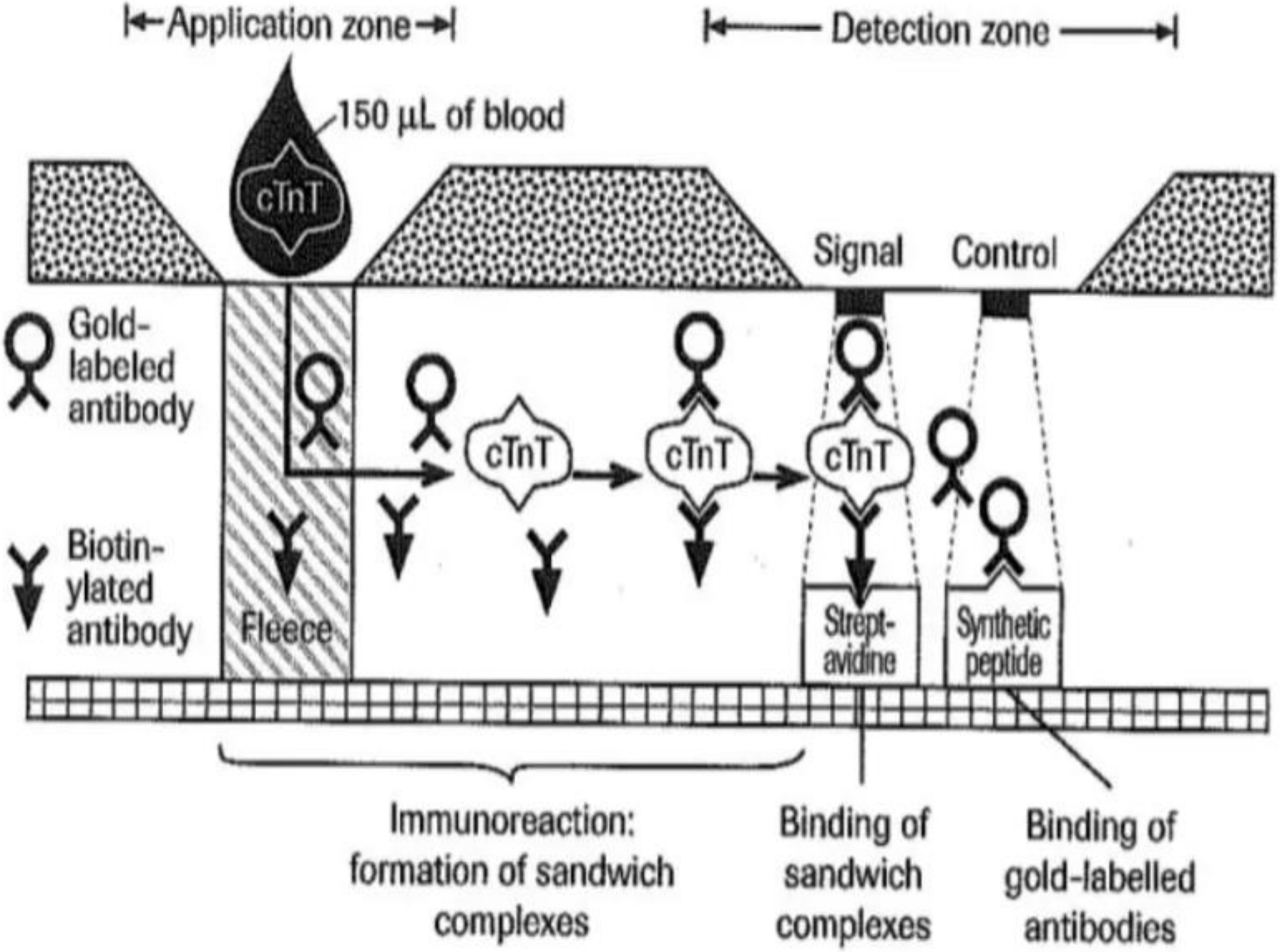

PCO_2 Sensor
PO_2/tHb/SO_2 Sensor
pH Sensor
Na^+ Sensor
Fingergrips
K^+ Sensor
Adapter (red) for syringe samples (removable for capillary samples)
Cl^-, Ca^{++} or Glu Sensor

Lateral flow immunoassays

It is a biological sensors in which the recognition agent is an antibody that binds to the analyte.

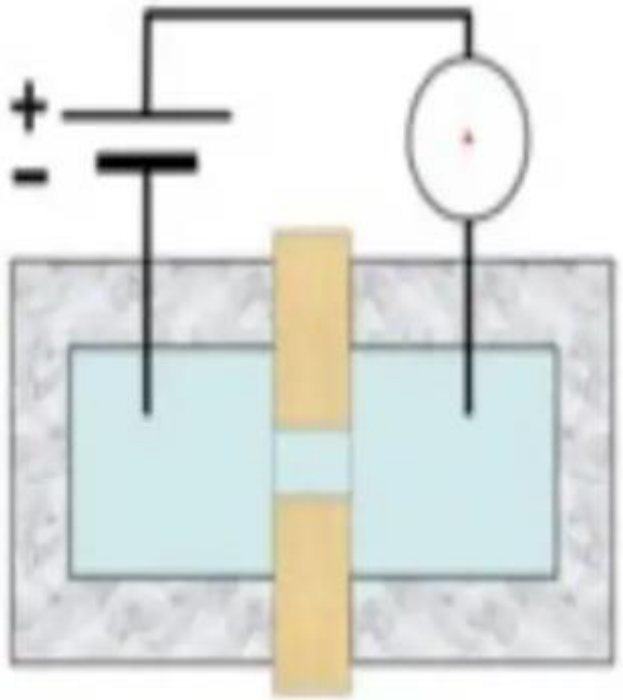
e.g. measurement of troponin T , myoglobin, and D-dimer.




Application zone
Detection zone
150 µL of blood
cTnT
Signal
Control
Gold-labeled antibody
Biotin-ylated antibody
Fleece
cTnT
cTnT
cTnT
Strept-avidine
Synthetic peptide
Immunoreaction: formation of sandwich complexes
Binding of sandwich complexes
Binding of gold-labelled antibodies

Electric Impedance

- Based on Coulter principle
- As fluid containing particles or cells is drawn through each micro-channel, each particle causes a brief change to the electrical resistance of the liquid.
- The counter detects these changes in electrical resistance.
- E.g. complete blood count



VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Department of Biochemistry

Report on Certificate course on Point of Care Testing (POCT)

Topic: Point of care testing (POCT)

Date: 29.04.2021

Venue: Biochemistry Demonstration Room

Target Audience: Faculties and M.B.B.S., students

Number of Participants: 141

Event Report: The event started with the welcome address by Dr.P.K.Mohanty. Following that DR. A. Hariharan started the lecture on POCT. He explained the basics concept in point of care testing and followed by this he showed a live demonstration of steps in estimation of capillary blood glucose, urine pregnancy testing and troponin I and its interpretation.

Outcome: Participants should be able to do the common point of care testing and should be able to interpretation the results.

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
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VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Velammal Medical College Hospital and Research Institute

Ref. No: VMCHRI/BIOCHEM/CC-8 Date: 03.05.2021

CIRCULAR

To

All Doctors

Certificate Course on Serum Protein Electrophoresis

Department of Biochemistry is organizing a certificate course on Serum protein electrophoresis on 27.05.2021 (Thursday) between at 9.00 AM to 3.00 PM.

All Faculties are invited.

VICE PRINCIPAL

Dr. P.K. MOHANTY
Vice Principal
Velammal Medical College Hospital
and Research Institute
Madurai-625 009

Copy submitted to:

The Hon. Chairman

Copy to:

The Dean

Medical Superintendent

Chief Administration Officer

HOD, Biochemistry

All Clinical and Non-Clinical HODs

VELAMMAL MEDICAL COLLEGE HOSPITAL AND RESEARCH INSTITUTE

ANUPPANADI, MADURAI - 625009

DEPARTMENT OF BIOCHEMISTRY

CERTIFICATE COURSE ON

SERUM PROTEIN ELECTROPHORESIS

Date: 27.05.2021 **Time:** 9.00 AM – 3.00 PM

Venue: Biochemistry Demonstration Room

For First year M.B.B.S., Students

PATRON

Chairman:

Shri.M.V.Muthuramalingam

Advisors:

Dean: Dr.T.Thirunavukarasu

MS: Dr. S.R.Damodaran

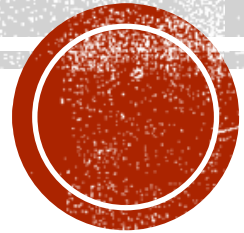
Dr.P.K.Mohanty
Course Coordinator
Vice Principle
Prof. Hod Biochemistry

Objectives: Should be able to perform serum protein electrophoresis and interpret the result

Teaching Methods: Lecture and demonstration

Time	Topic	Speaker
9.00 – 9.15 AM	Welcome Address	Dr.K.Suganthy
9.15 – 9.45 AM	Pre Test	DR.P.K.Mohanty
9.45 – 11.00 AM	Electrophoresis - Basics	DR.P.K.Mohanty
11.00 AM – 1.00 PM	Demonstration: Serum Protein Electrophoresis	DR.P.K.Mohanty
1.00 – 2.00 PM	Lunch	
2.00 – 2.30 PM	Post Test	DR.P.K.Mohanty
2.30 – 3.00 PM	Feed Back And Valediction	Dr.K.Suganthy

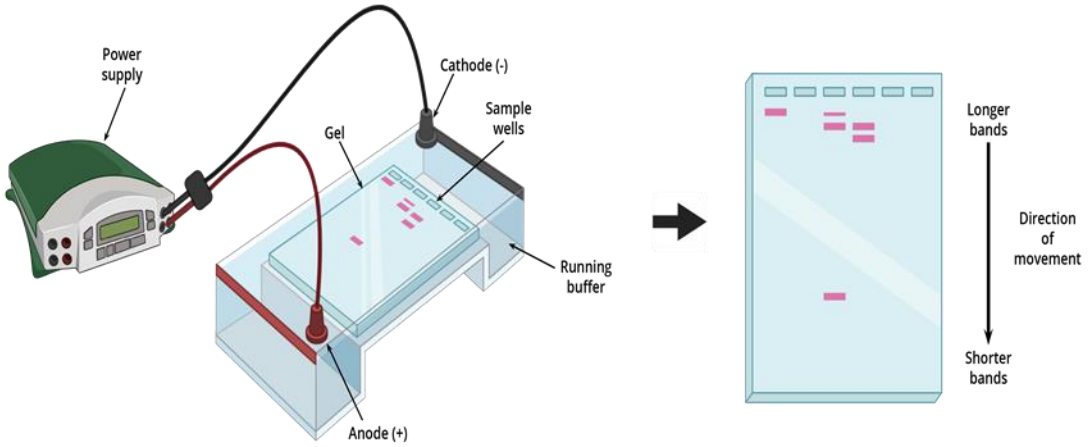
Serum protein electrophoresis



Dr.P.K.Mohanty M.D., (Biochemistry)

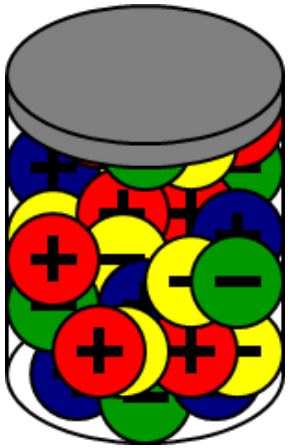
Contents

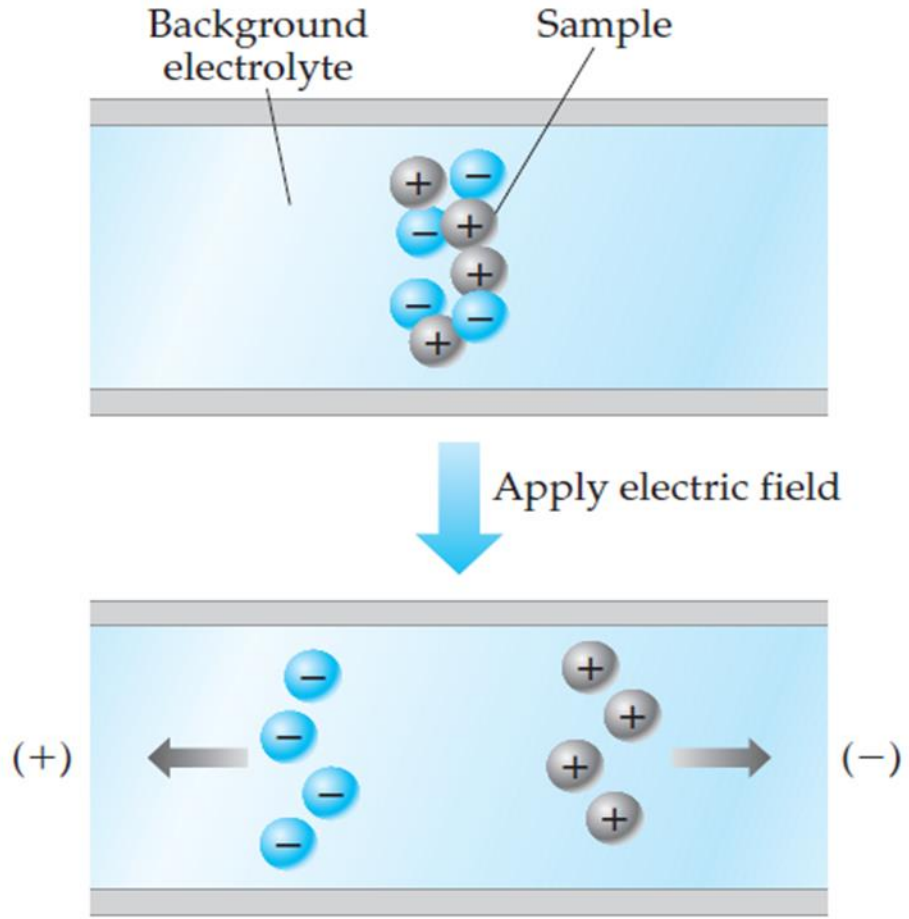
- Definition
- Principle of electrophoresis
- Requirements of agarose gel electrophoresis
- Procedure
- Electrophoretic pattern in various diseases



What is electrophoresis?

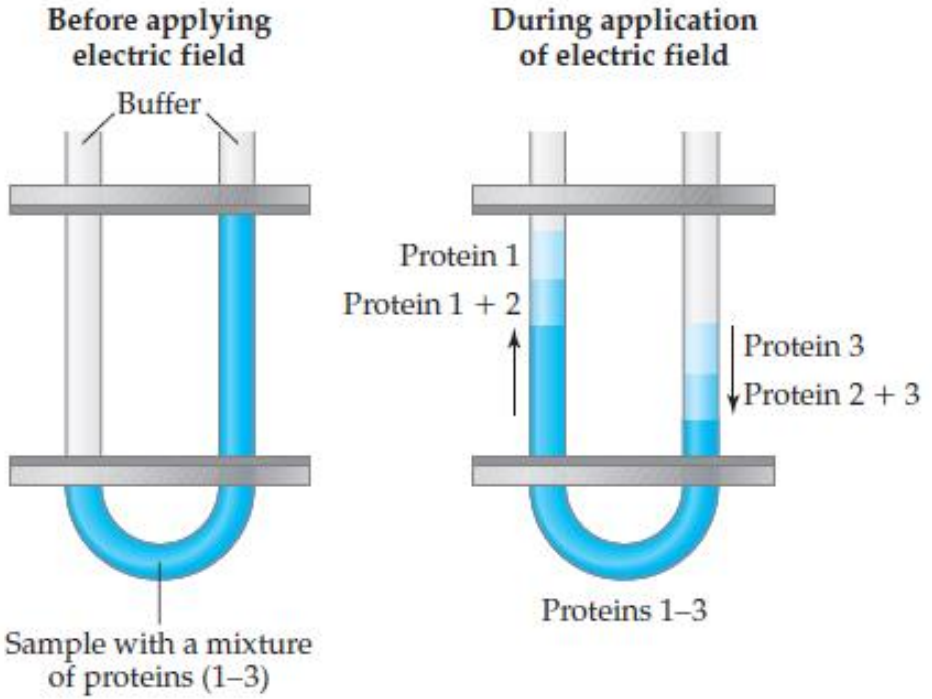
- Movement of charged particles through an electrolyte when subjected to an electrical field.





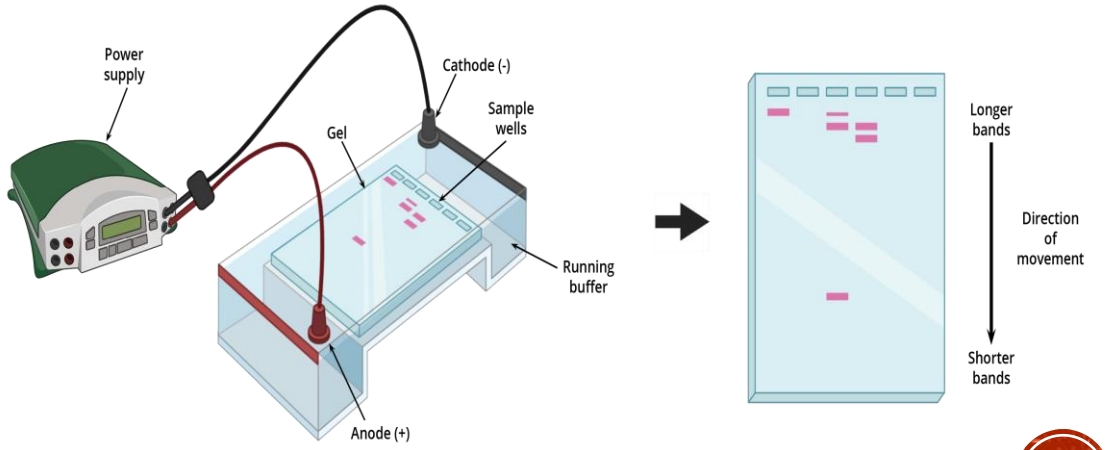
History

- Invented by Tiselius



Clinical applications of electrophoresis

- a separation technique
- Simple, rapid and highly sensitive
- used in clinical laboratories to separate charged molecules from each other in presence of electric field
    - Proteins in body fluids: serum, urine, CSF
    - Proteins in erythrocytes: haemoglobin
    - Nucleic acids: DNA, RNA
    - Lipoprotein analysis
    - Isoenzyme separation

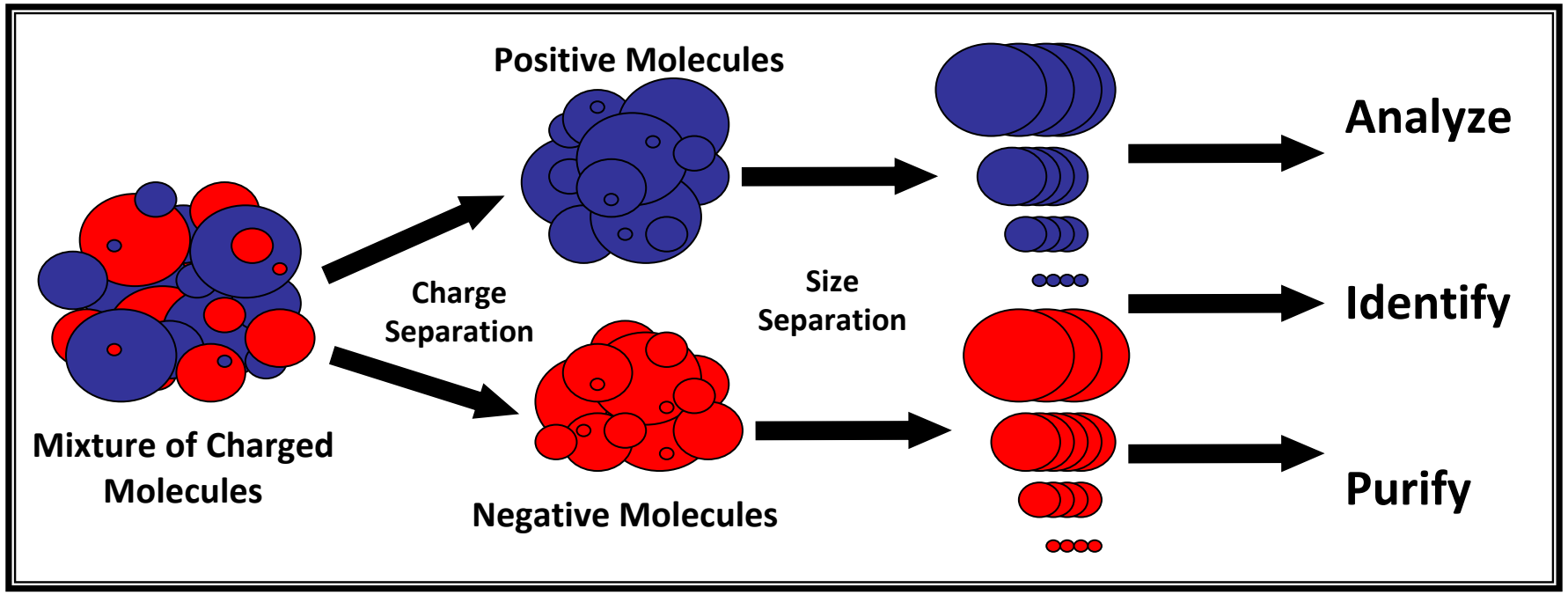


Principle

- Comprehensive term that refers to the migration of charged particle of any size in liquid medium under the influence of an electric field.
- Depending on kind of charge the molecule carry, they move towards either
    - To cathode
    - To Anode
- An ampholyte become positively charged in acidic condition and migrate to cathode, in alkaline condition they become negatively charge and migrate to anode.

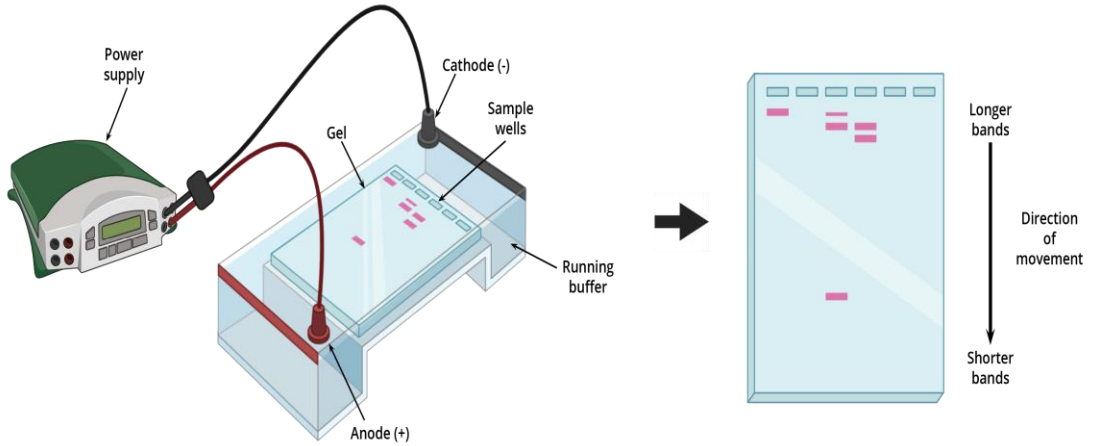
Types of separation

- Native : Charge/ Mass
- Denaturing : Mass



Factors affecting Electrophoresis

- Net charge
- Mass
- Shape
- pH of medium
- Strength of electrical field
- Viscosity of medium
- Temperature



Factors affecting Electrophoresis

- The Electrophoretic mobility is directly proportional to net charge and inversely proportional to molecular size/mass and viscosity of the electrophoresis medium
- The pH of solution affects the mobility of the ion by determining the amount and nature of charge

Electrophoresis of Biomolecules

- Proteins, nucleic acids, nucleotides and amino acids bear charged polar groups making them suitable groups for electrophoresis
- Carbohydrates carrying no charged groups are first bound to charged groups like Borate or Sulfite ions and then electrophoresis is carried out
- Lipids are not electrophoresed because electrophoretic current requires polar solvents in which most lipids are insoluble

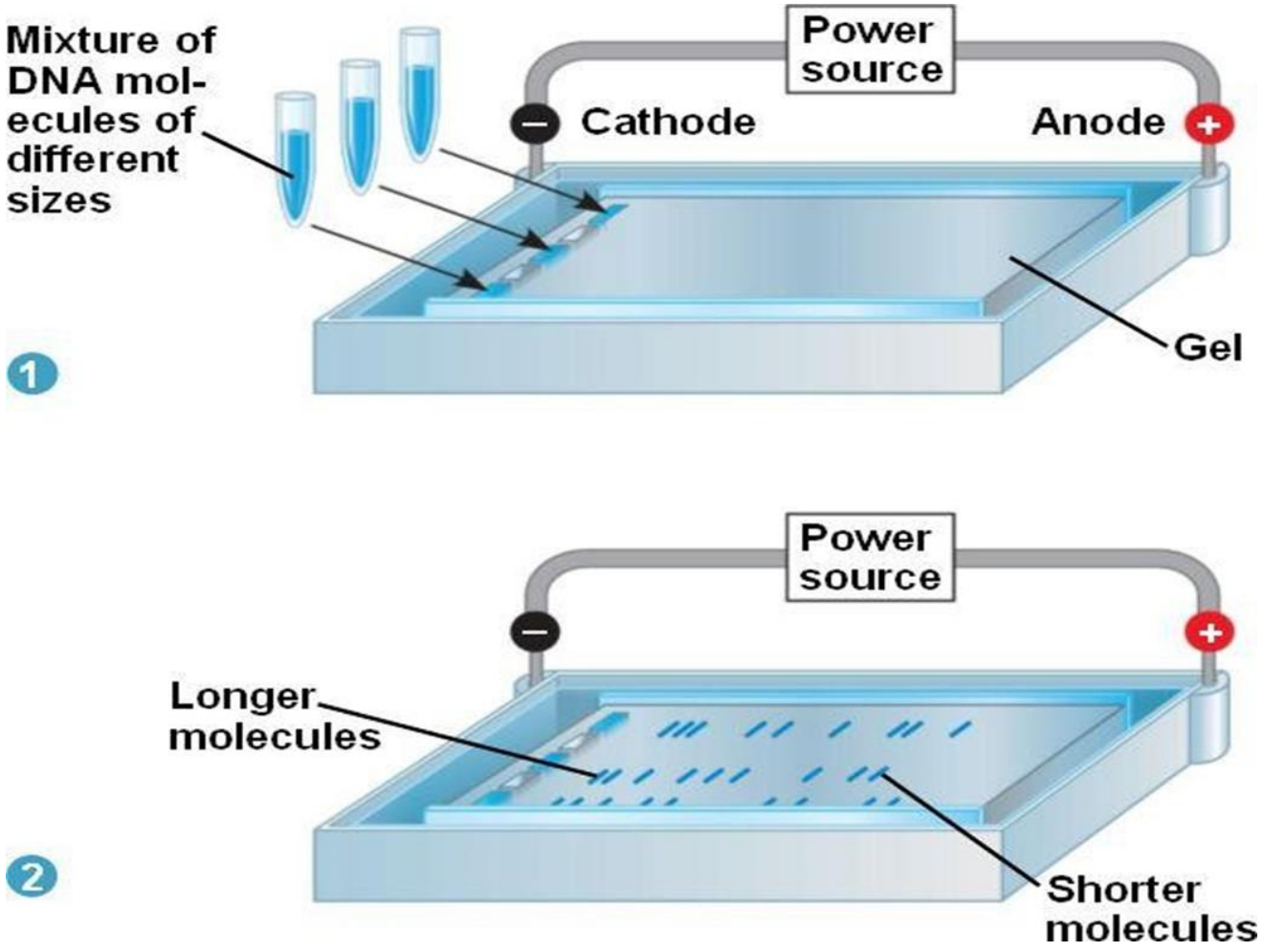
Factors affecting Electrophoresis

- The rate of migration depends on size, shape, net charge & the applied current

$$v = EqF$$

  - v= velocity
  - E= electric field (v/cm)
  - q=net charge
  - F= Frictional coefficient

- Charge – Higher the charge, greater the mobility
- Shape – rounded contour elicit less frictional and electrostatic retardation compared to sharp contour. Therefore globular proteins moves faster than fibrous proteins.

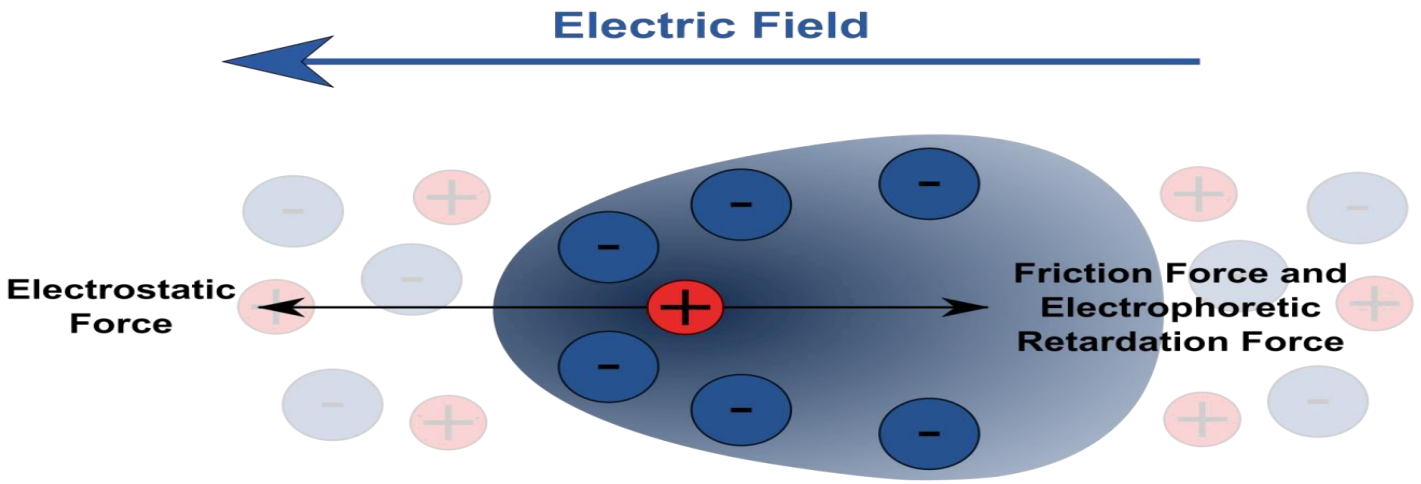

Mixture of DNA molecules of different sizes
Power source
Cathode
Anode
Gel
1
Power source
Longer molecules
Shorter molecules
2

Strength of electrical field

- It determined by the force exerted on the particle, and the charge the particle carrying.

$$F=QV$$

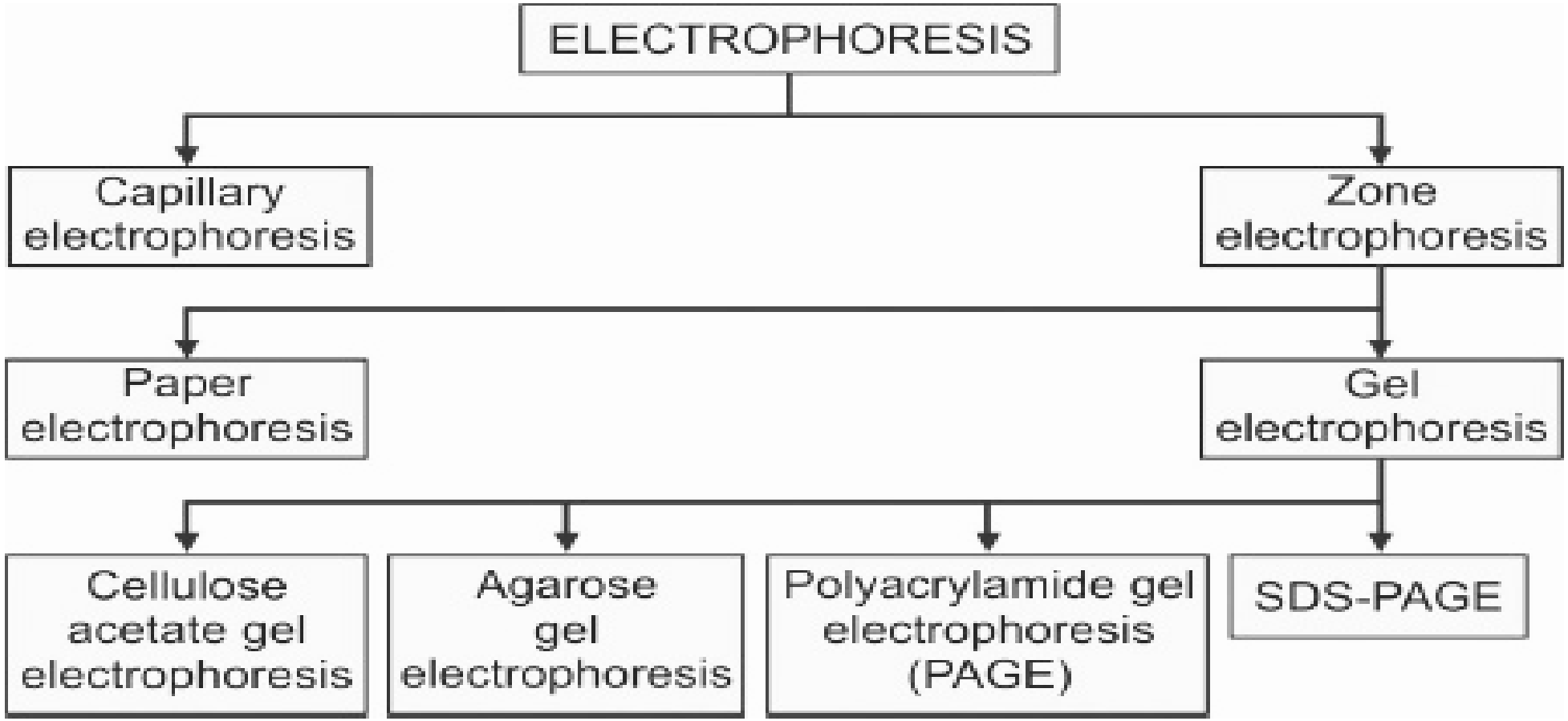
when force is exerted on the particle it start moving, however the moment is restricted by the experience of the frictional force because of the viscosity.



Effect of pH on Mobility

- As the molecule exist as amphoteric , they will carry the charges based on the solvent pH.
- Mobility is directly proportional to the magnitude of the charge, which is functional of the pH of solvent.
- The pH is maintained by the use of buffers of different pH.

Types of electrophoresis

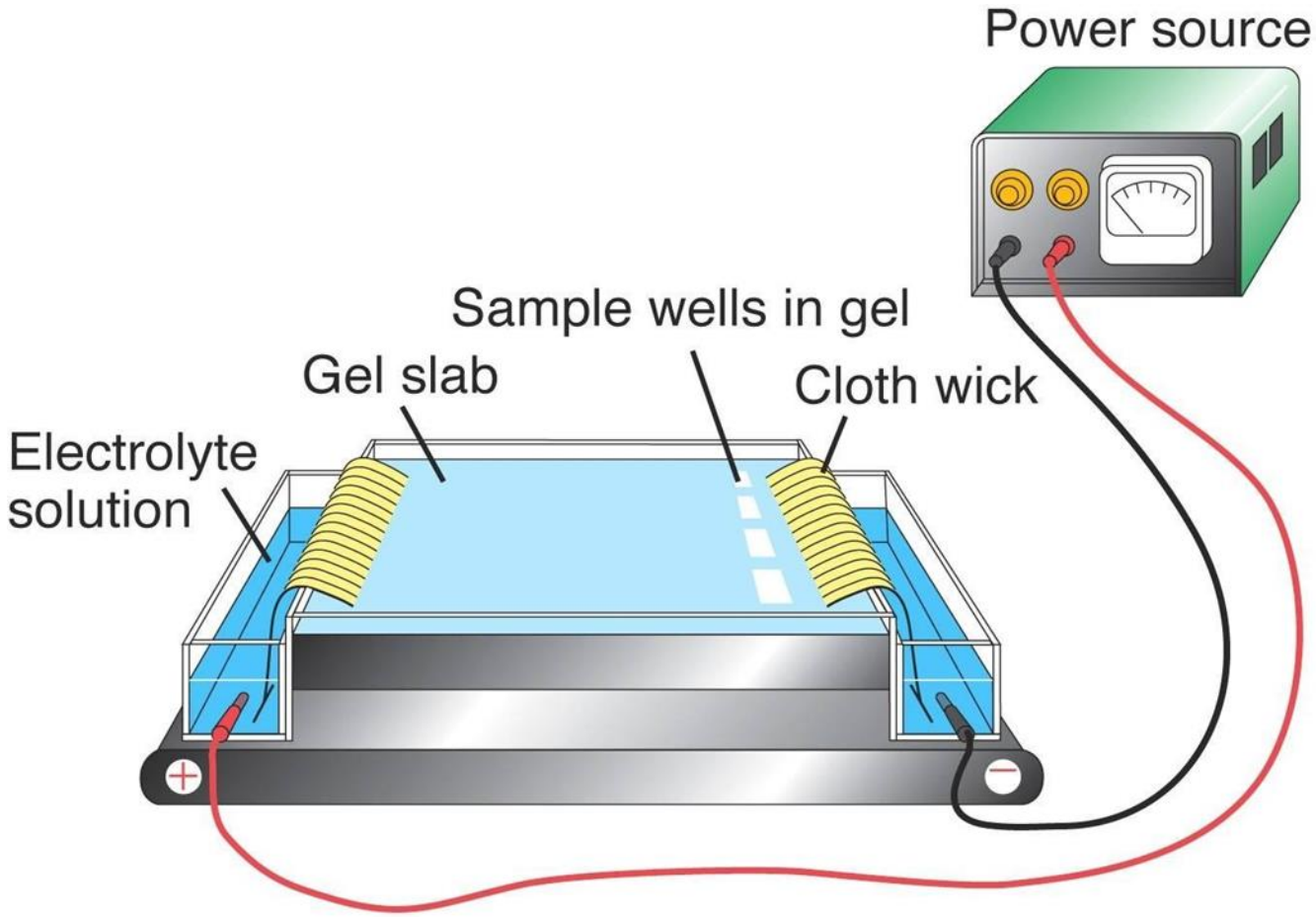


Gel Electrophoresis

- “Gel" is the matrix used to contain, and then separate the target molecules
- The gel is a cross linked polymer whose composition and porosity is chosen based on the specific weight and composition of material to be analyzed
- A gel block made of Polyacrylamide, Agarose or substituted starch gel is used in this method as the solid support
- *Agarose gel - separation of different types of protein mixtures*
- *Polyacrylamide is best suitable for separation of nucleic acids.*

Instrumentation

- Two reservoir for the buffer
- Power supply and Electrodes
- Supporting medium



Requisites for Agarose gel Electrophoresis

- Electrophoresis apparatus
- Supporting medium - Agarose
- Buffer
- Power pack to supply constant current and voltage
- Tracking dye
- Fixing solution
- Staining solution
- Destaining solution

Electrophoresis apparatus

Electrophoresis apparatus

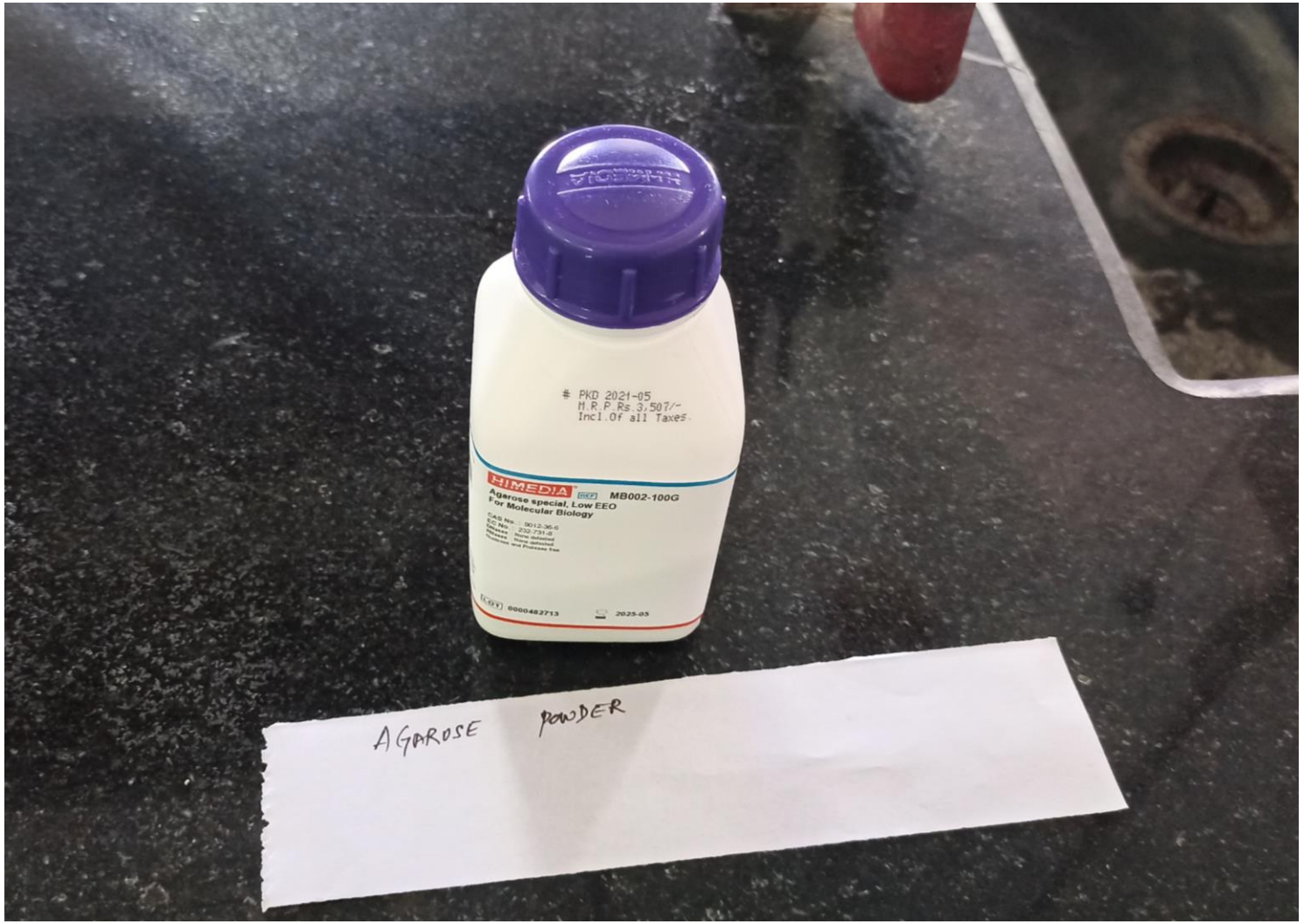
Supporting medium

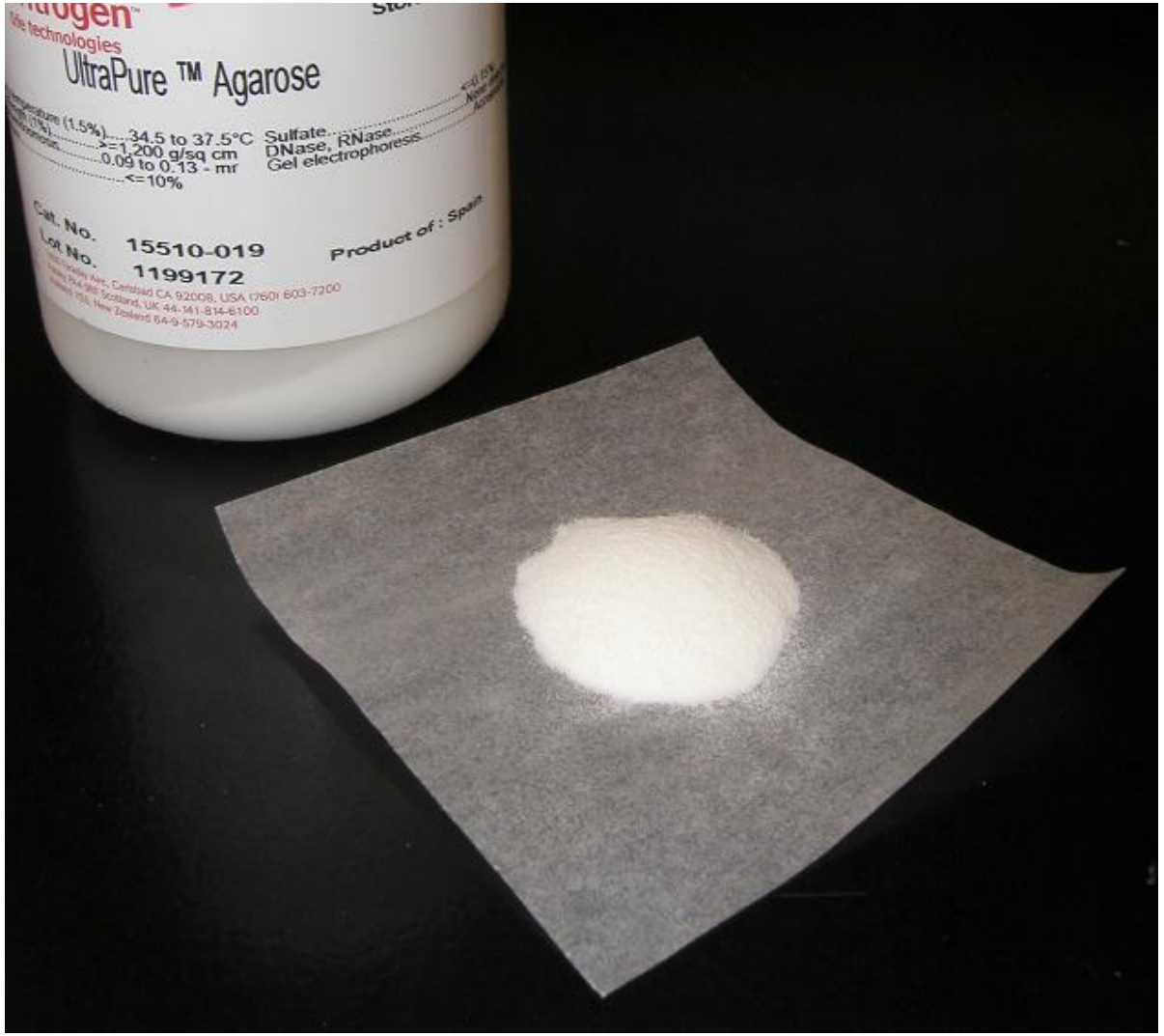
- Supporting medium is an matrix in which the protein separation takes place.
- Separation is based on to the charge to mass ratio of protein depending on the pore size of the medium, possibly the molecular size.
- Starch gel
- Cellulose acetate
- Agarose
- Polyacrylamide gel

Properties of supporting medium

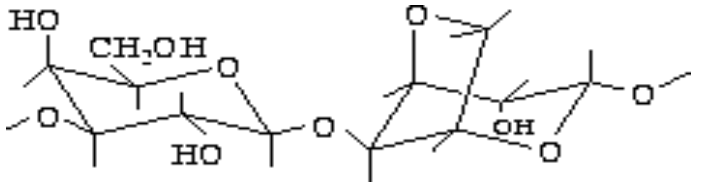
Chemical nature	inert
Availability	easy
Electrical conductivity	high
Adsorptivity	low
Sieving effect	controlled
Porosity	high
Electro-endosmosis (EEO)	low
Preservation	feasible
Toxicity	low
Preparation	easy

Agarose


HIMEDIA
MB002-100G
Agarose special, Low EEO
For Molecular Biology
AGAROSE
POWDER



Agarose



D-galactose 3,6-anhydro L-galactose

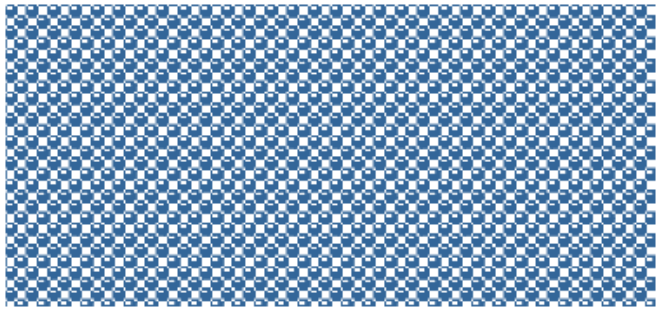
Agarose was first used in biology when Robert Koch* used it as a culture medium for Tuberculosis bacteria in 1882

***Lina Hesse**, technician and illustrator for a colleague of Koch was the first to suggest agar for use in culturing bacteria

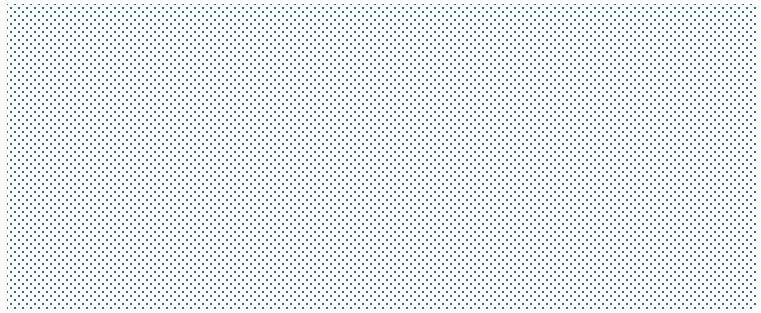
Agarose is a linear polysaccharide extracted from seaweed.

Agarose

- Used in conc as 1% and 3%.
- The gelling property are attributed to both inter-and intramolecular hydrogen bonding
- Pore size is controlled by the % of agarose used.
- Large pore size are formed with lower conc and vice versa.

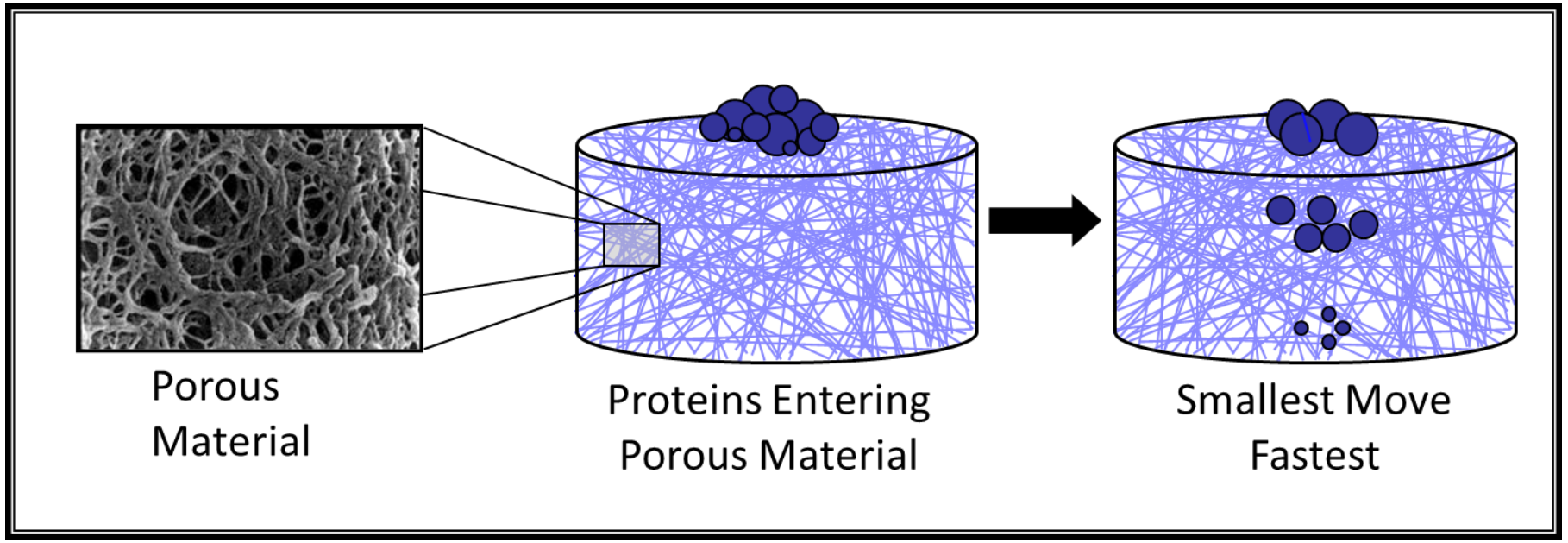


1% agarose

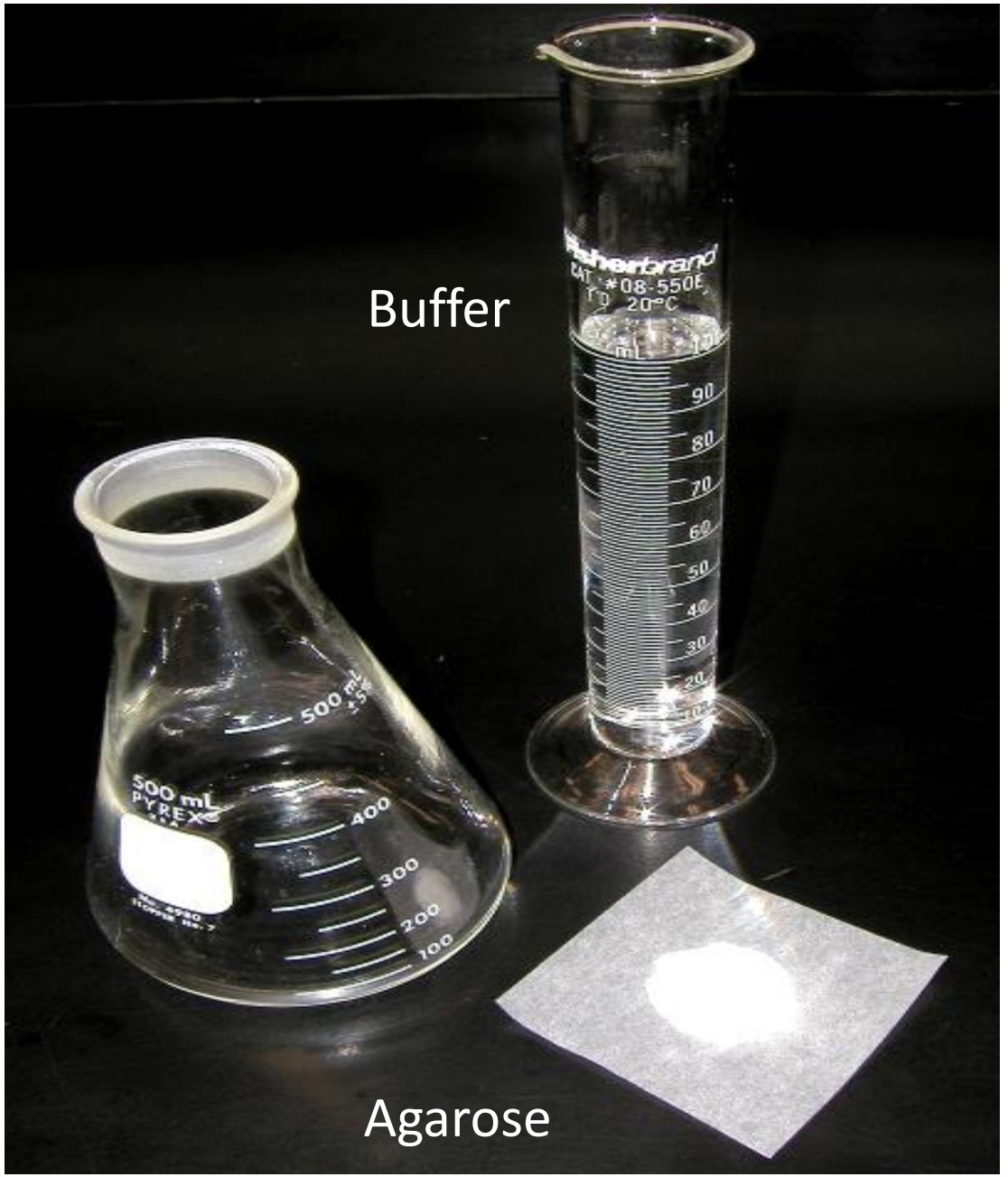


2% agarose

Acts as molecular sieve



An agarose gel is prepared by combining agarose powder and a buffer solution.

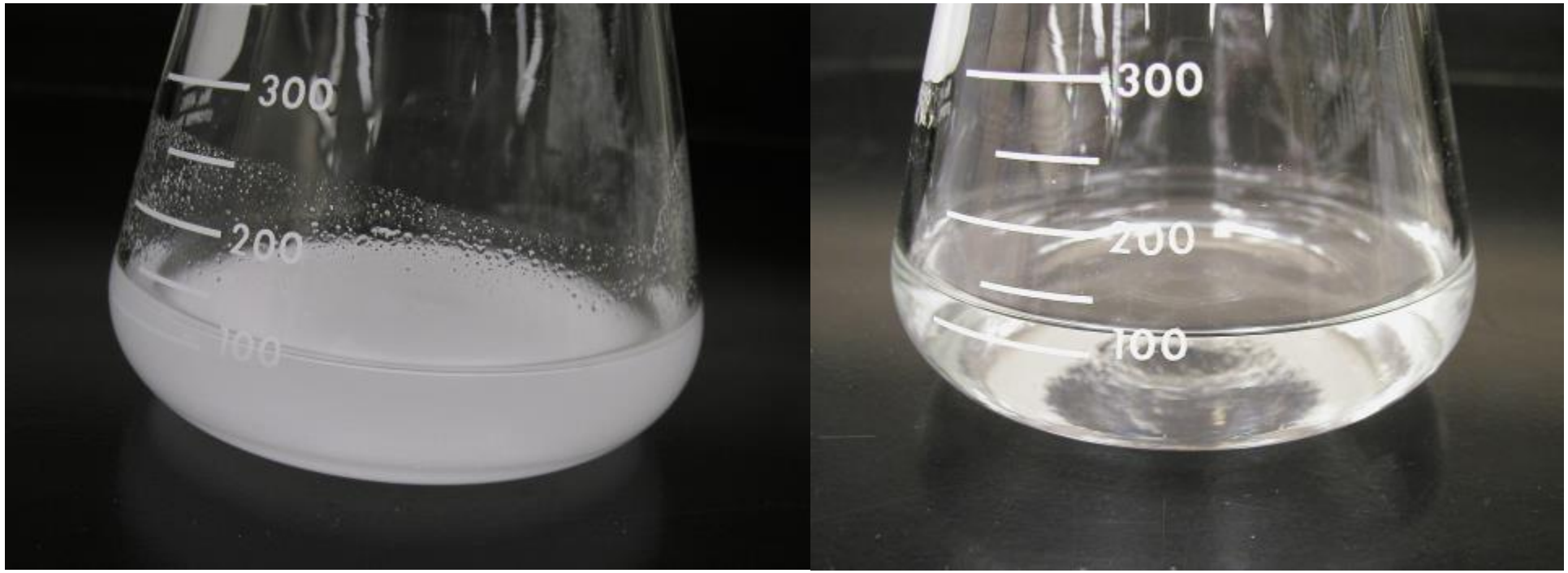


Agarose

Buffer Solution

Combine the agarose powder and buffer solution. Use a flask that is several times larger than the volume of buffer.

Melting the Agarose



Agarose is insoluble at room temperature (left).
The agarose solution is boiled until clear (right).

Gently swirl the solution periodically when heating to allow all the grains of agarose to dissolve.
***Be careful when boiling - the agarose solution may become superheated and may boil violently if it has been heated too long in a microwave oven.

Buffer

The buffer in electrophoresis has two purpose:

- Carry applied electrical current
- They set the pH as which electrophoresis is carried out.

Thus they determine;

- Type of charge on solute.
- Extent of ionization of solute
- Electrode towards which the solute will migrate.

The buffer ionic strength will determine the thickness of the ionic cloud.

Commonly used buffers

Commonly used buffers are,

- Phosphate buffer
- Tris-Borate-EDTA buffer (TBE)
- Tris-Acetate EDTA buffer (TAE)
- Tris -EDTA buffer (TE)
- Lithium Borate - buffer (LB)
- Tris -Citrate-EDTA buffer (TCE)

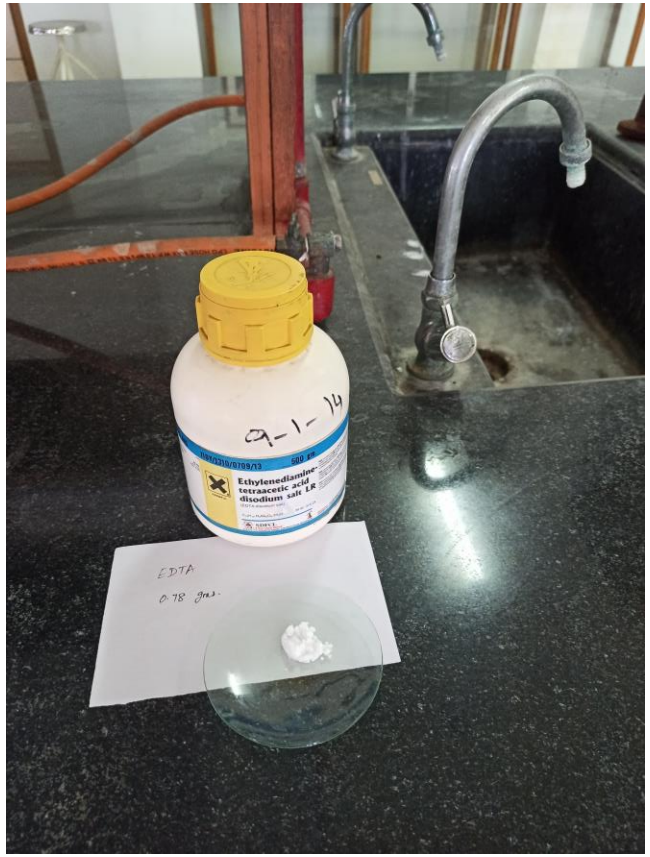
TBE Buffer

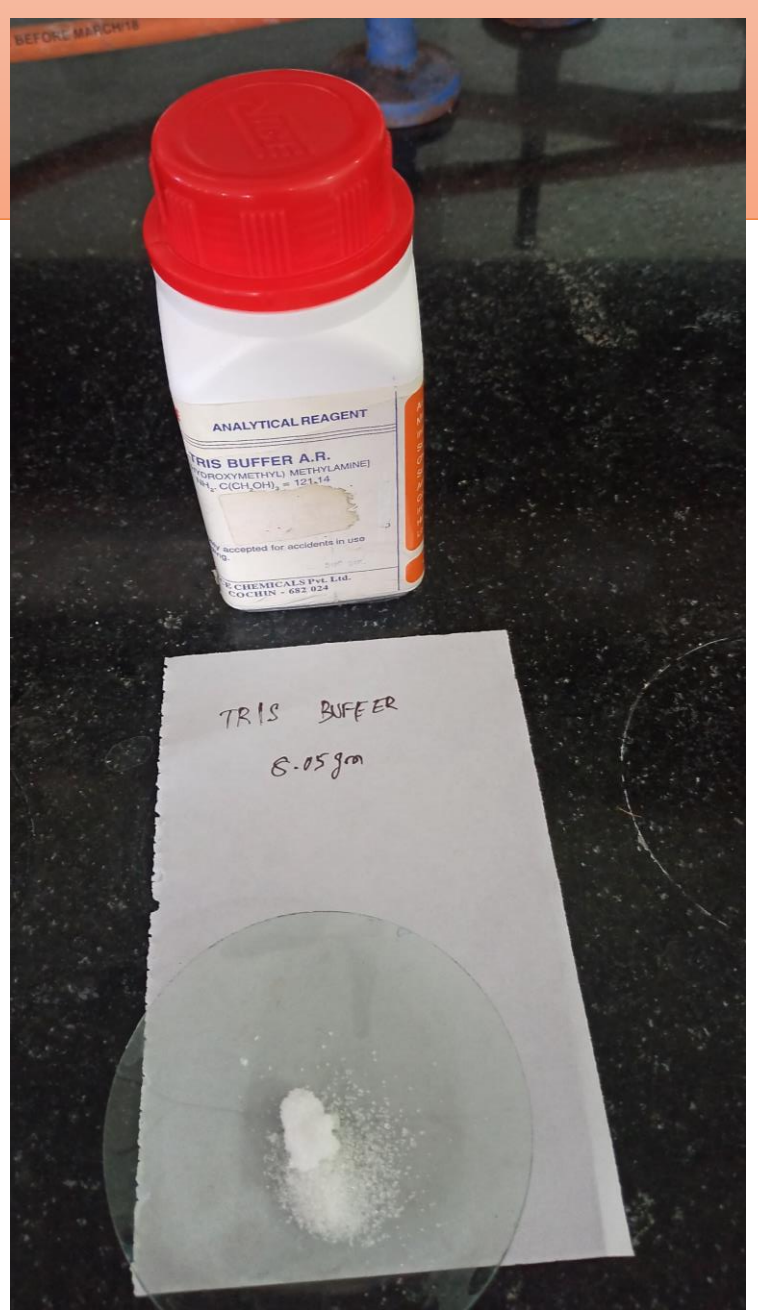
TAE (Tris -acetate-EDTA) and TBE (Tris-borate-EDTA) – pH buffer of 8.6

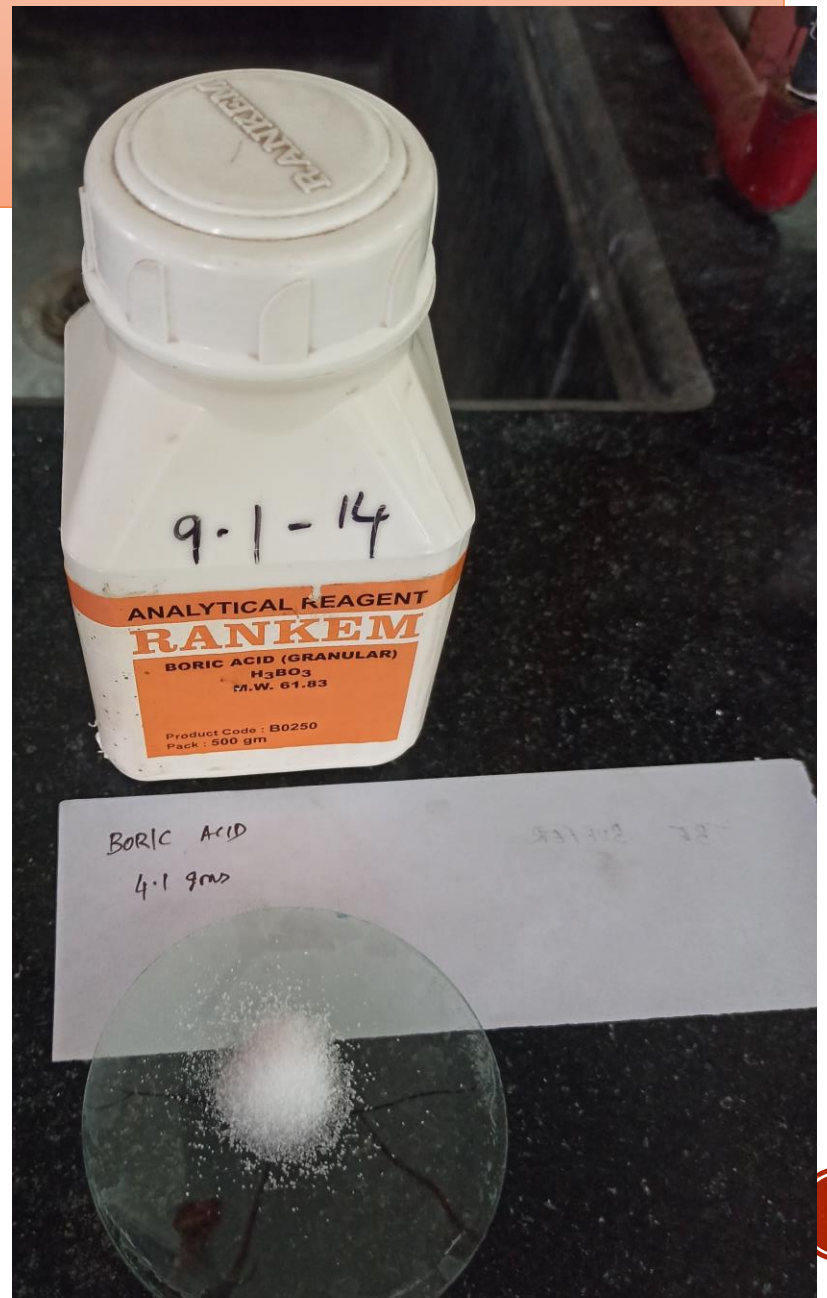
- Tris a pH buffer.
- Acetic acid provide ions to support conductivity and maintain pH.
- EDTA, prevent brake down of molecules.

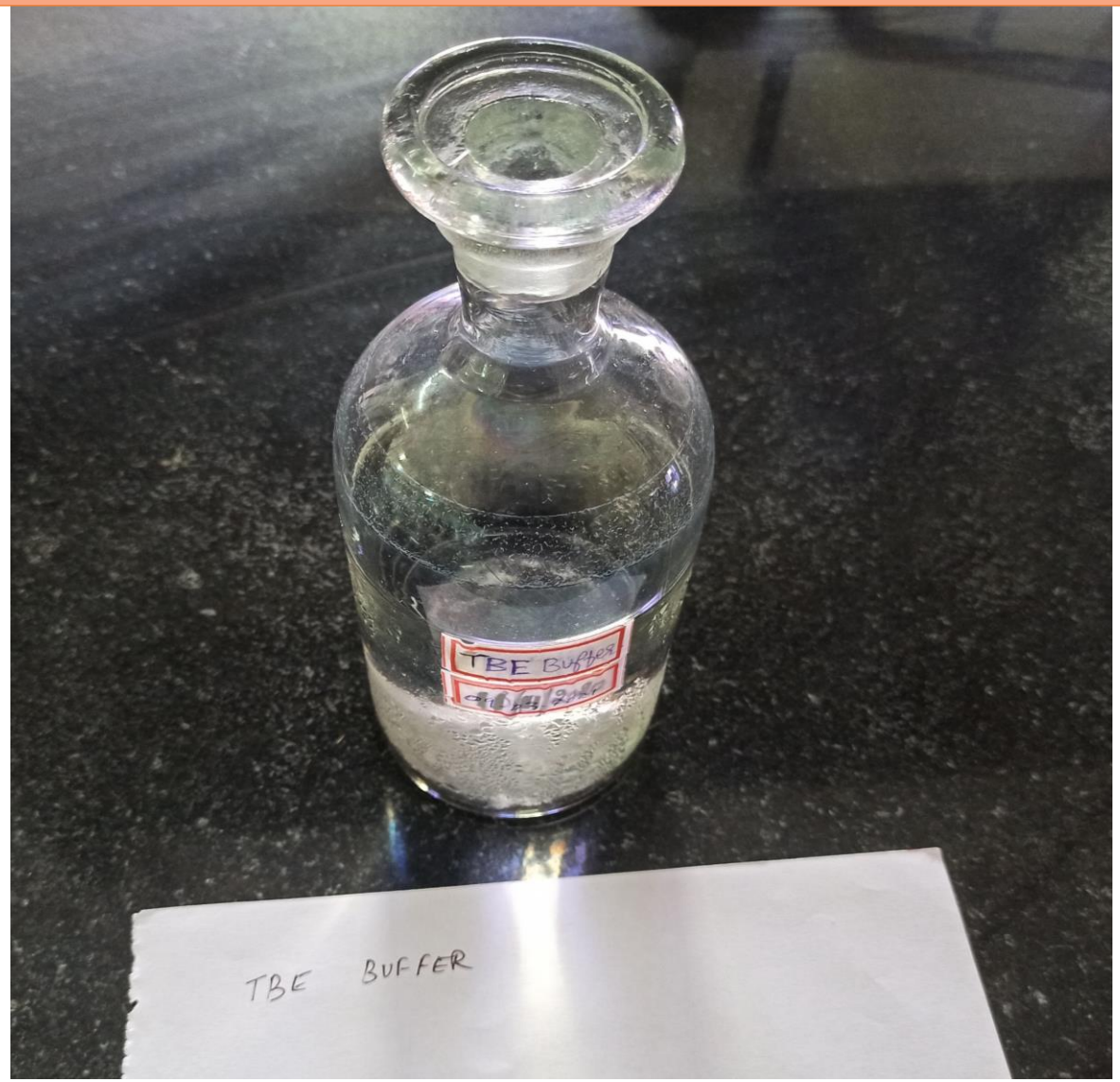
  “all dissolved in water”.

- The important feature of any buffer is that it contains an electrolyte so that it can conduct electricity.


9-1-14
Ethylenediamine-tetraacetic acid disodium salt
EDTA
0.78 gms

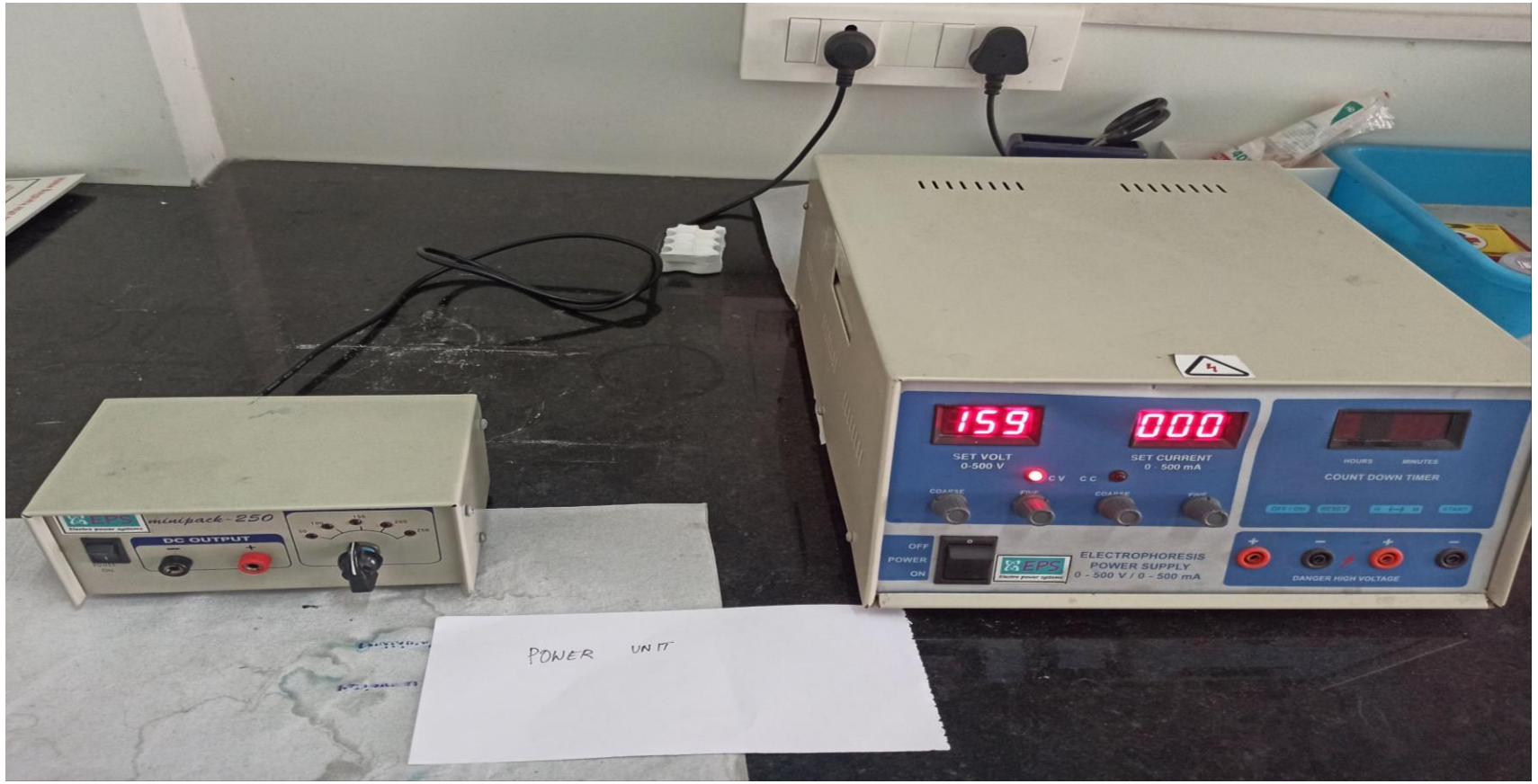

ANALYTICAL REAGENT
RIS BUFFER A.R.
CHEMICALS Pvt. Ltd.
COCHIN - 682 024
TRIS BUFFER
8.05 gm


9-1-14
ANALYTICAL REAGENT
RANKEM
BORIC ACID (GRANULAR)
H3BO3
M.W. 61.83
Product Code : B0250
Pack : 500 gm
BORIC ACID
4.1 gms


TBE Buffer
TBE BUFFER

Power supply

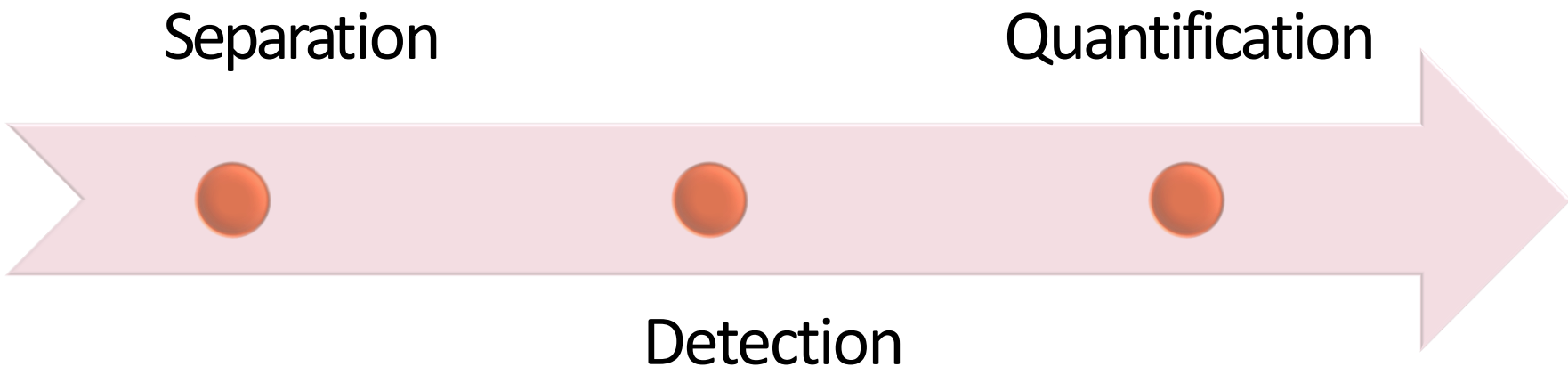
- Drives the moment of ionic species in the medium and allow the adjustment and control of the current or voltage.
- Constant delivery is required.



Power supply

- Flow of current -> Heat produced
  - increase in migration rate -> broadening of separated samples
  - formation of convection currents -> mixing of separated samples
  - thermal instability of heat sensitive samples
  - water loss -> concn of ions -> decrease of buffer viscosity -> decrease in resistance
- To minimize problems: use constant-current power supply

General operation

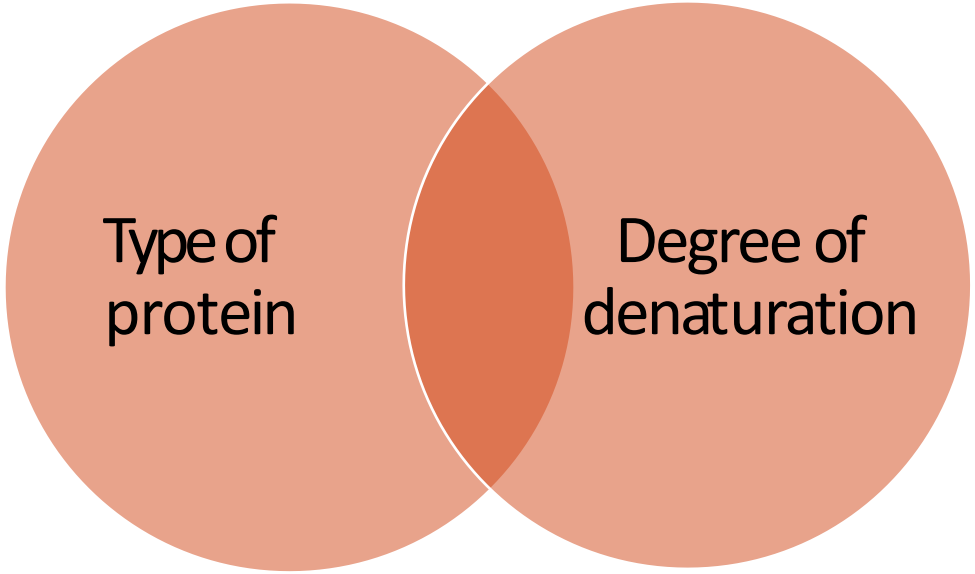


Steps performed:

- Buffer in buffer tank after pH check
- 5-7 µL sample with tracking dye
- Placed in electrode chamber
- Whatmann paper wick is applied
- Current application
- Gel is fixed and dried
- Stained and destained
- Scanned under densitometry

Staining

- Fixation of Protein - by using acetic acid or methanol (this will prevent diffusion of protein out of the gel when submerged in stain solution)
- Amount of dye taken by sample is affected by many factors,



Different stains of Electrophoresis

Plasma Proteins

- Amido black
- Coomassie Brilliant Blue
- Bromophenol Blue

Hemoglobin

- Amido black
- Coomassie Brilliant Blue
- Ponceau Red

Lipoproteins

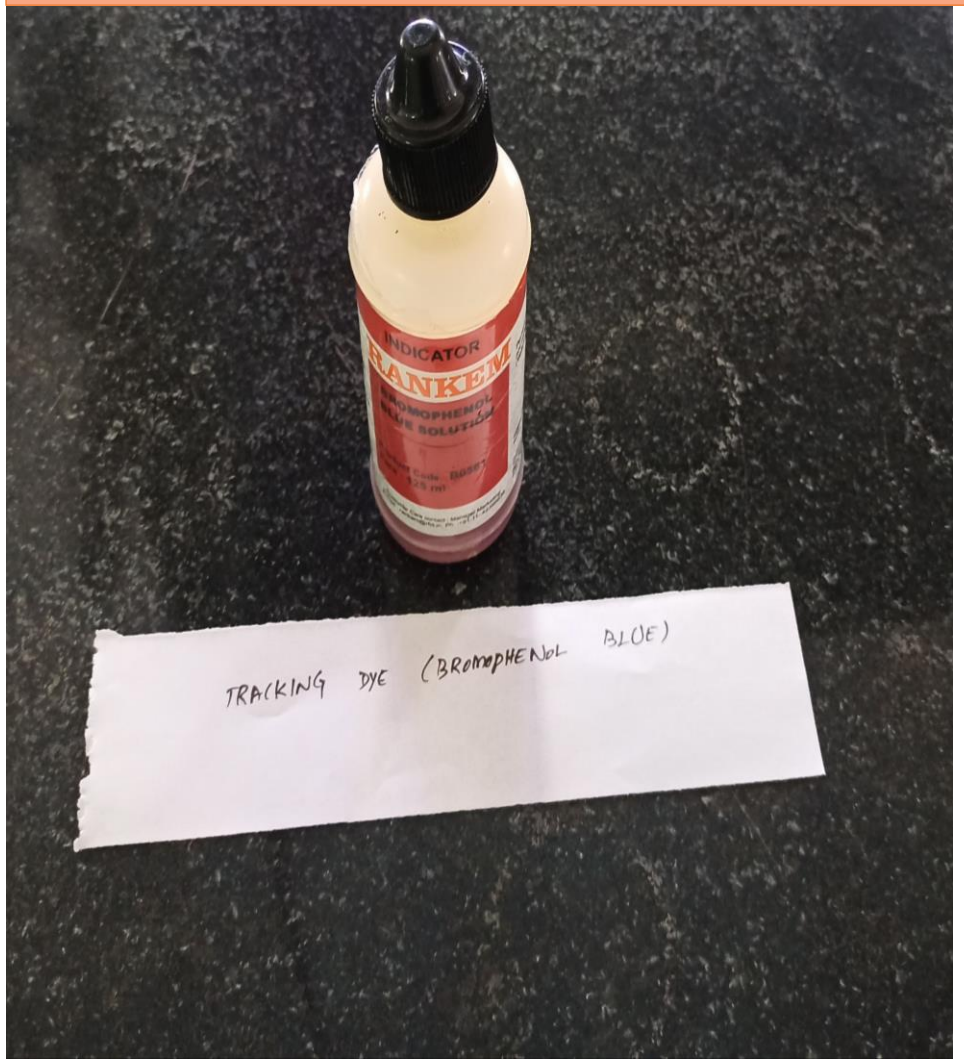
- Sudan Black
- Oil red O

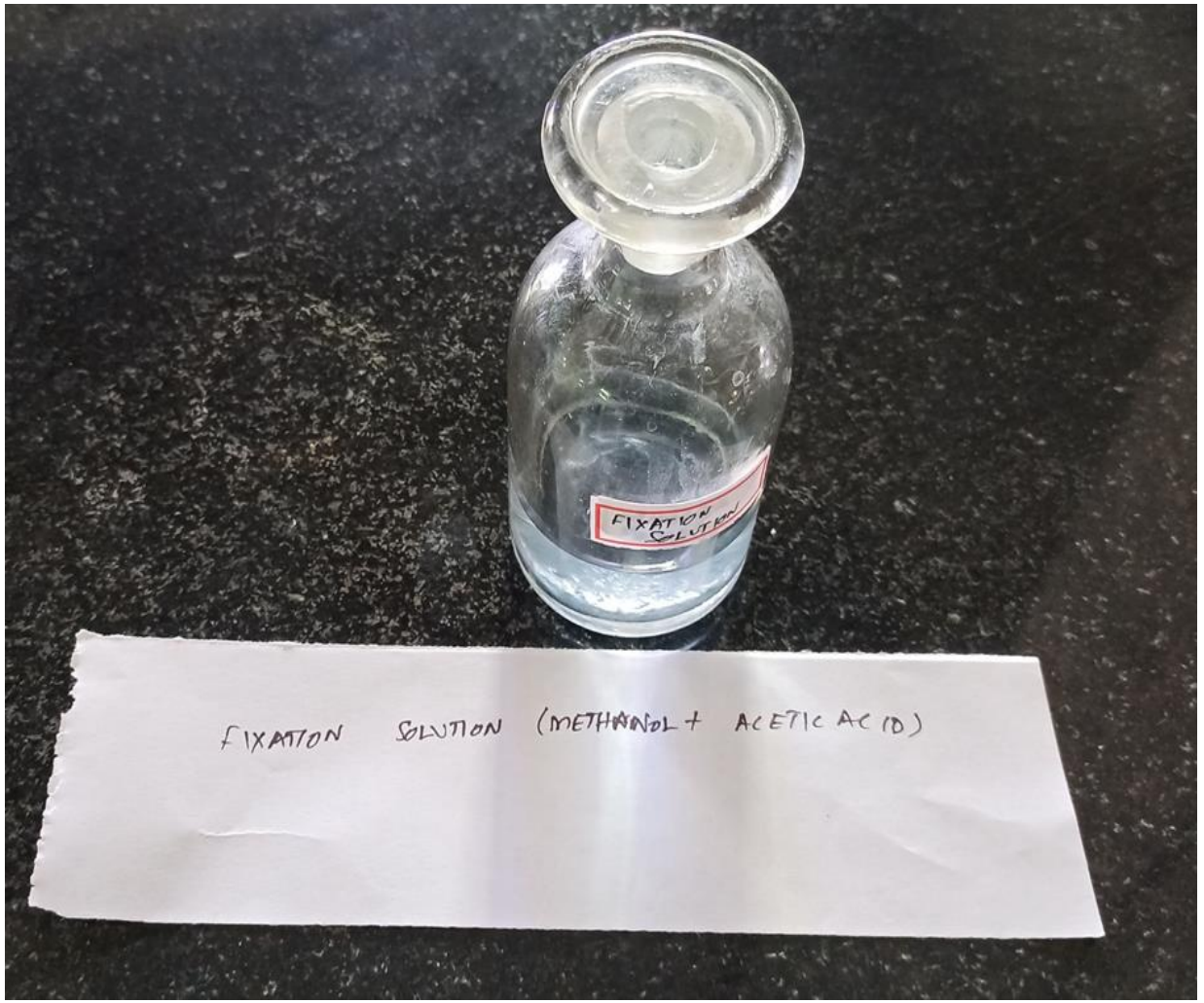
DNA (Fluorescent dyes)

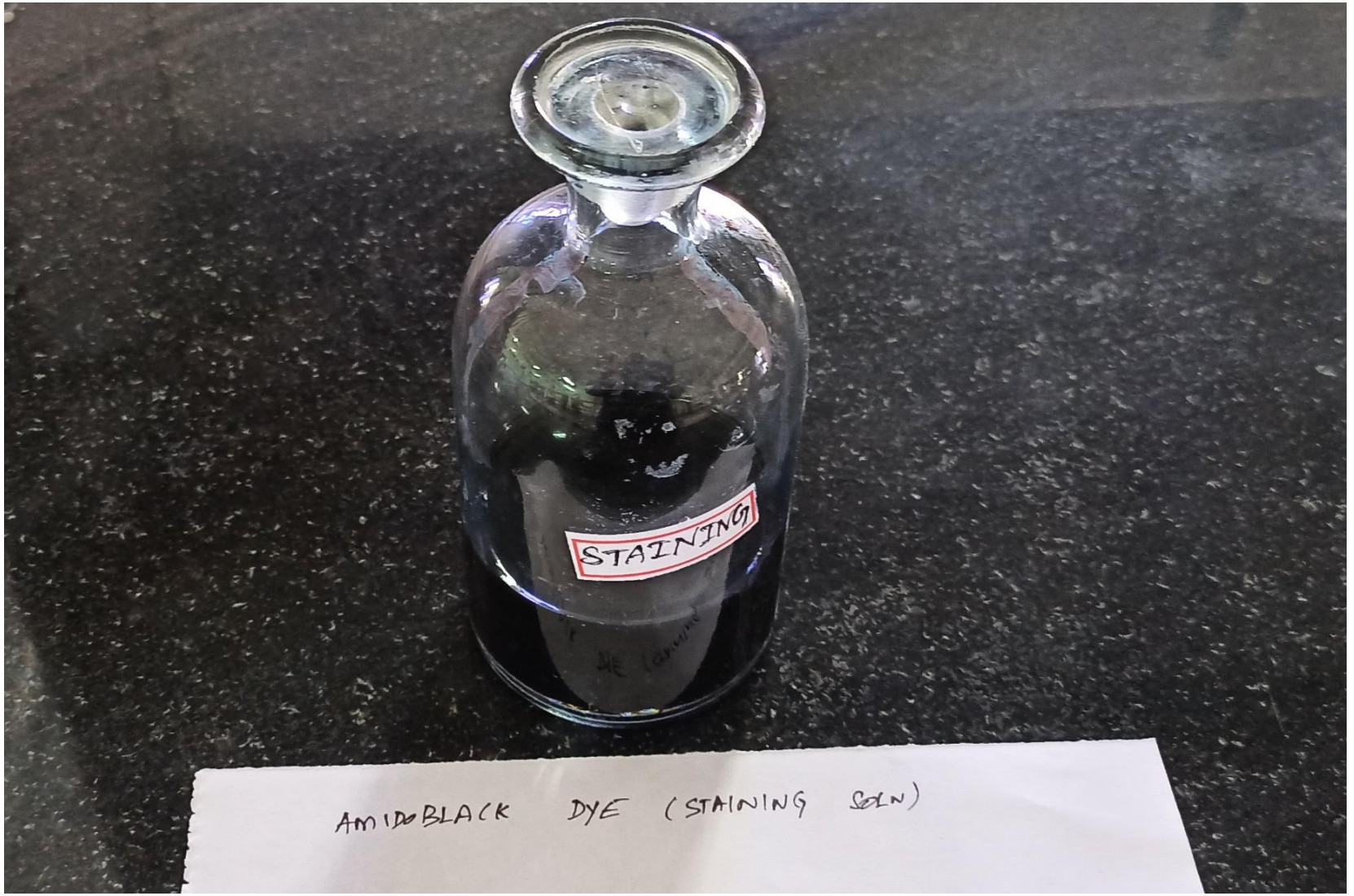
- Ethidium Bromide
- Sybr Green, Sybr Gold

Steps in running a sample

- Tracking the sample with bromophenol blue
- Fixing with methanol & acetic acid
- Staining with amido black
- Destaining with 5 % acetic acid


INDICATOR
RANKEM
TRACKING DYE (BROMOPHENOL BLUE)

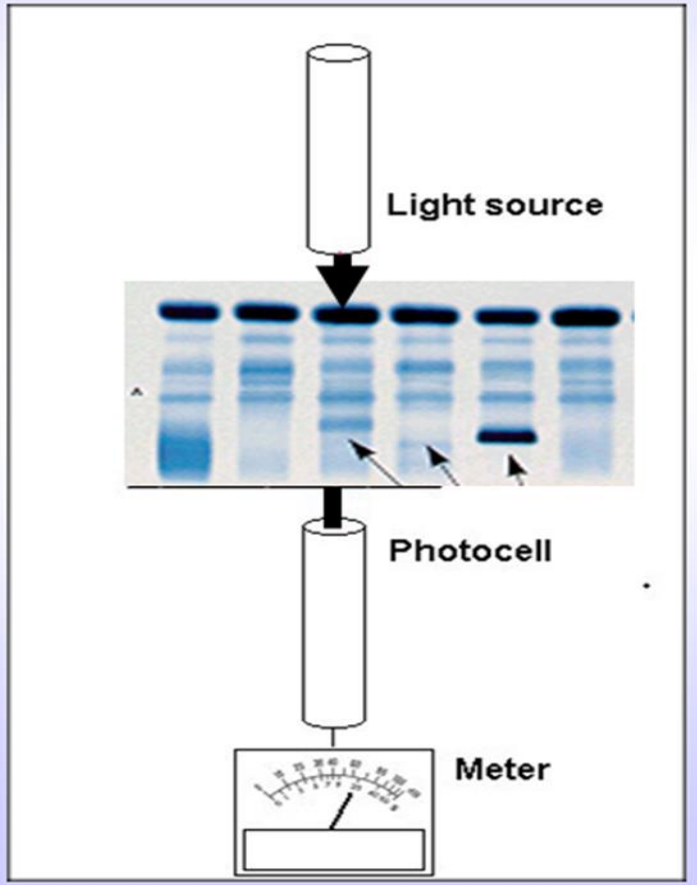

FIXATION SOLUTION
FIXATION SOLUTION (METHANOL + ACETIC ACID)


STAINING
AMIDO BLACK DYE (STAINING SOLN)

Detection and Quantification

- Once separated, protein may be detected by staining followed by the quantification using the densitometer.

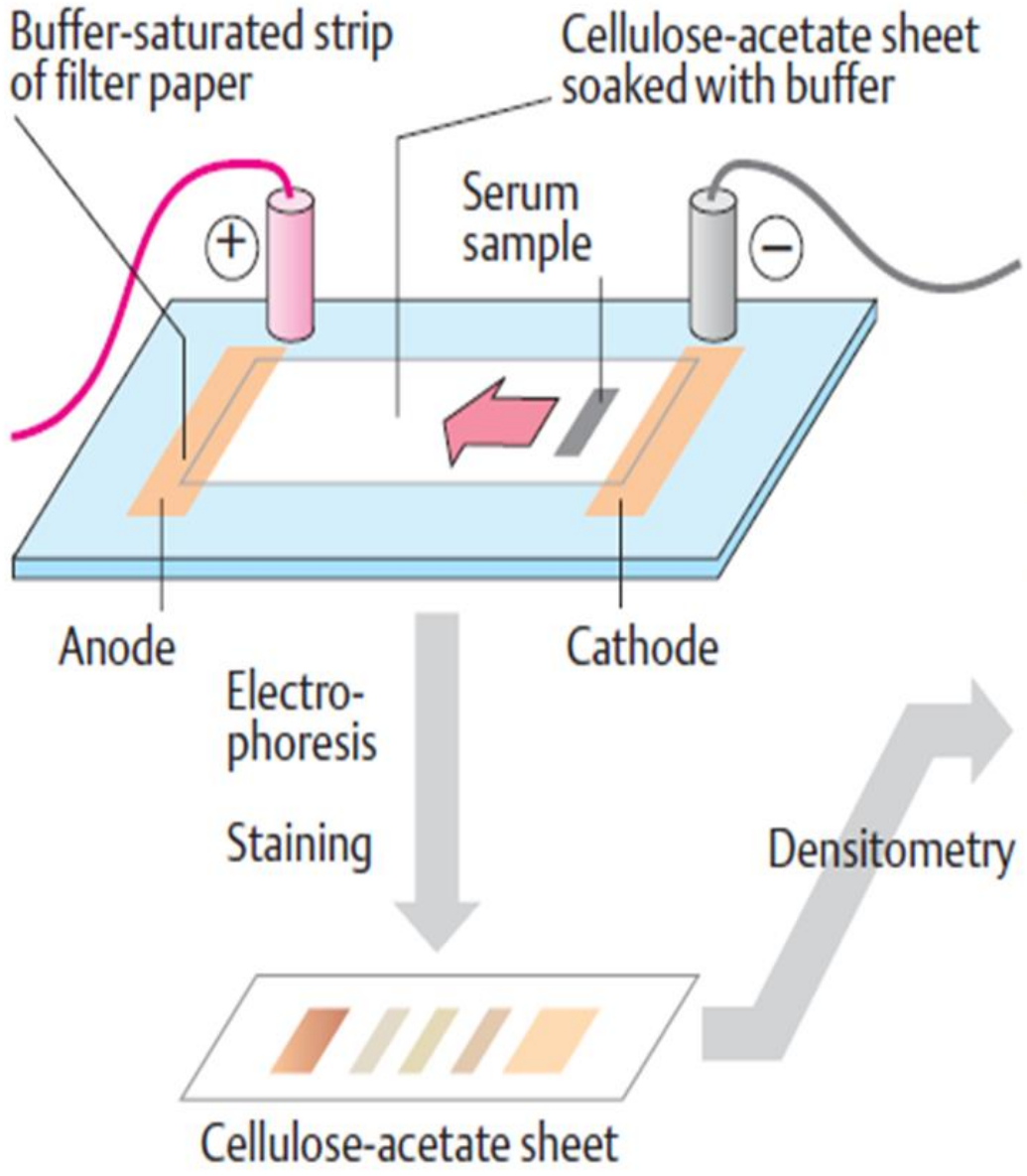
⌘ Densitometer is a device that measures the degree of darkness in photographic or semi-transparent material.

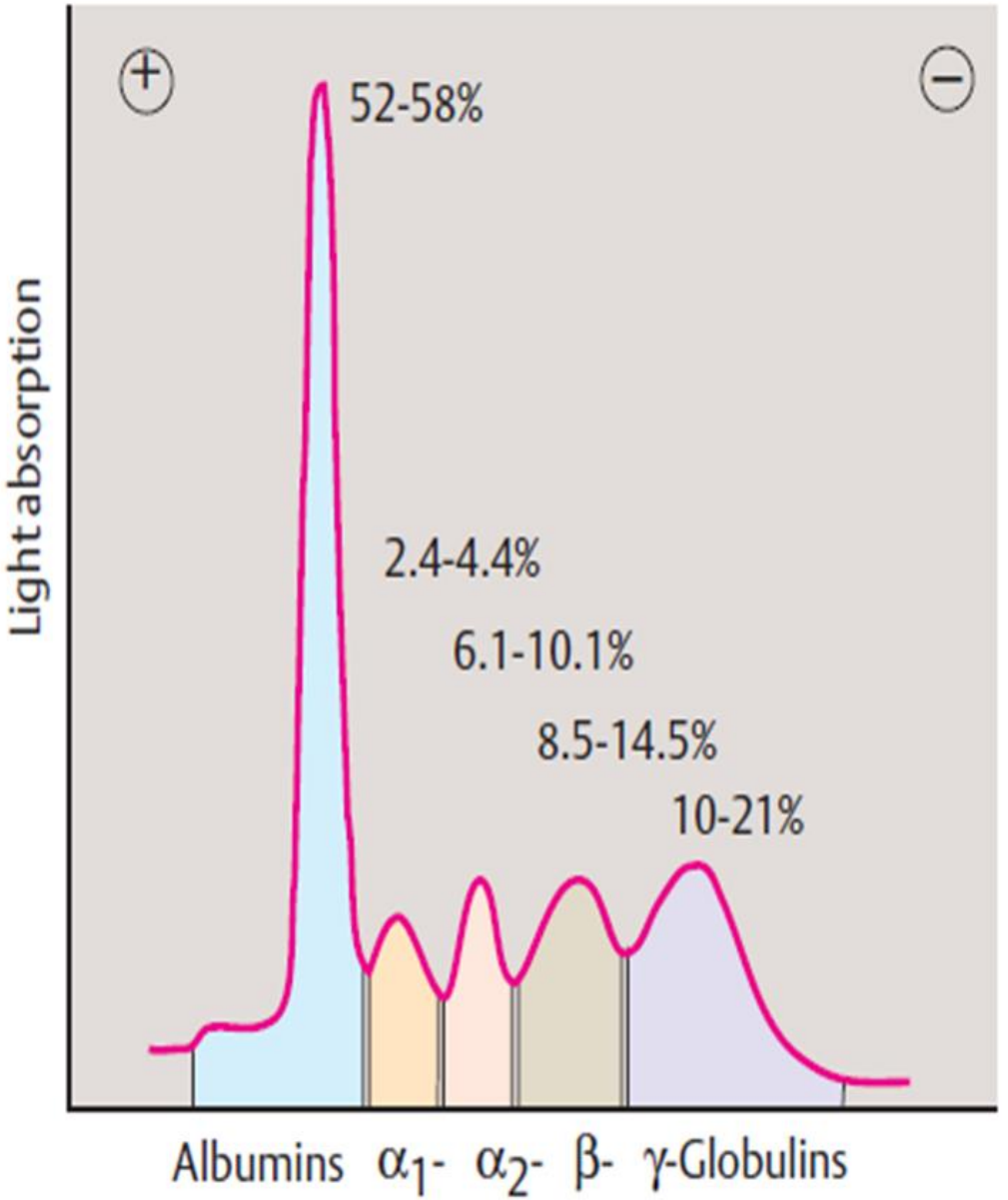


Common effect of variables on separation

pH	Changes charge of analyte, effective mobility; structure of analyte-denaturing or dissociating a protein.
Ionic strength	Changes in voltage; increased ionic strength reduces migration velocity and increase heating.
Ions present	Change migration speed; cause tailing of bands.
Current	Too high current cause overheating.
Temperature	Overheating cause denature protein; lower temp reduce diffusion but also migration; there is no effect on resolution.
Time	Separation of bands increases linearly with time, but dilution of bands increase with square root of time.
Medium	Major factors are endosmosis and pore size effect, which effect migration velocities.

B. Electrophoresis





Paper Electrophoresis

- The support medium is a filter paper
- 10µl serum is applied in the form of thin line on hydrated Whatman no1 filter paper
- Chamber are filled with buffer (pH 8.6) and constant current of 1-2 mA
- Time duration to run the test is 10-16 hrs
- Paper is then stained with Bromophenol blue to visualize individual bands
- Drawback- long time interval and blurring of margins

Cellulose Acetate Membrane Electrophoresis

- Preferred solid support media
- Less time consuming
- Excellent separation
- No blurring of margins
- Membranes can be stored for a longer time
- Widely used for separation of Proteins, lipoproteins and hemoglobin variants

Poly Acrylamide Gel Electrophoresis (PAGE)

- Most popular type
- Polyacrylamide is a polymer formed when acrylamide is heated with a variety of catalysts with or without cross linking agents
- It is thermostable, transparent, strong and relatively chemically inert
- Gels are uncharged and are prepared in a variety of pore sizes
- Proteins are separated on the basis of charge to mass ratio and molecular size, a phenomenon called Molecular sieving.
- PAGE is the backbone of blotting techniques

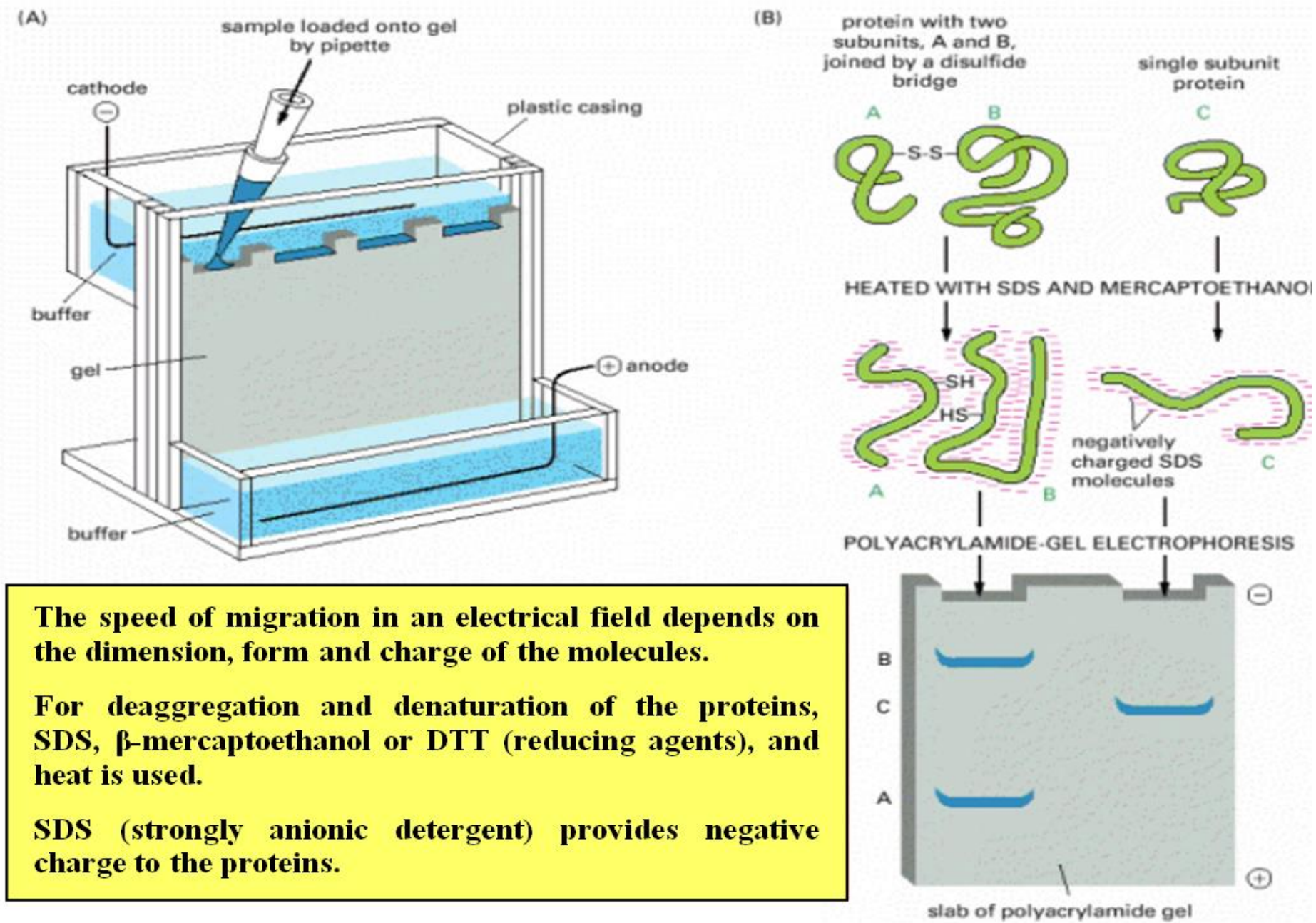
Types of PAGE

PAGE can be classified according the separation conditions into:

- *Native-PAGE: –* Separation is based upon charge, size, and shape of macromolecules. Useful for separation and/or purification of mixture of proteins – This was the original mode of electrophoresis.
- *Denatured-PAGE or SDS-PAGE* – Separation is based upon the molecular weight of proteins. The most common method for determining MW of proteins – Very useful for checking purity of protein samples.

PAGE-Procedure

- The gel of different pore sizes is cast in to a column inside a vertical tube, often with large pore gel at the top and small pore gel at the bottom.
- Microgram quantity of the sample is placed over the top of the gel column and covered by a buffer solution having such a p H so as to change sample components in to anions
- The foot of the gel column is made to dip in the same buffer in the bottom reservoir.
- Cathode and anode are kept above and below the column to impose an electric field through the column
- Rate of migration depends on the charge to mass ratio

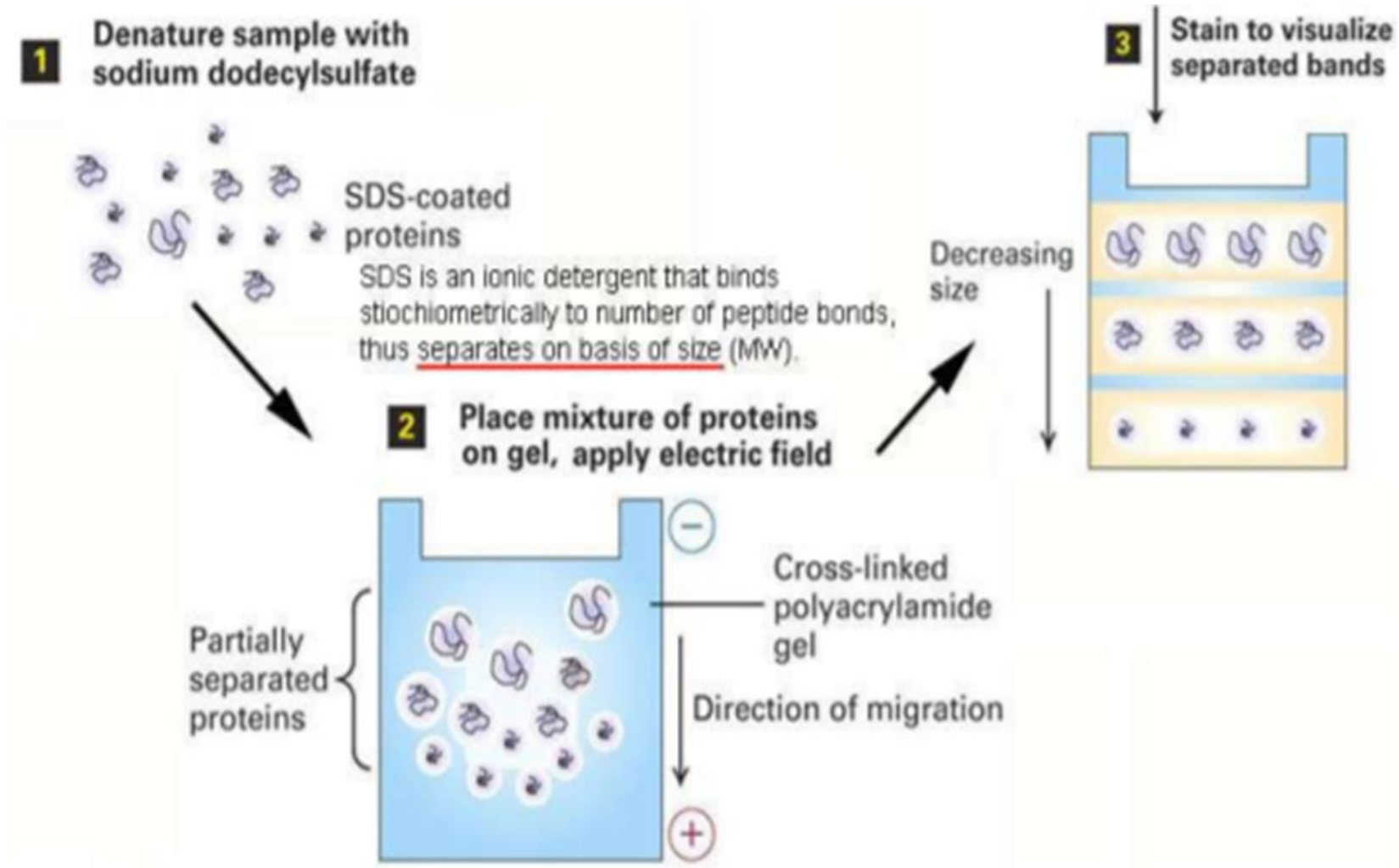


The speed of migration in an electrical field depends on the dimension, form and charge of the molecules.

For deaggregation and denaturation of the proteins, SDS, β-mercaptoethanol or DTT (reducing agents), and heat is used.

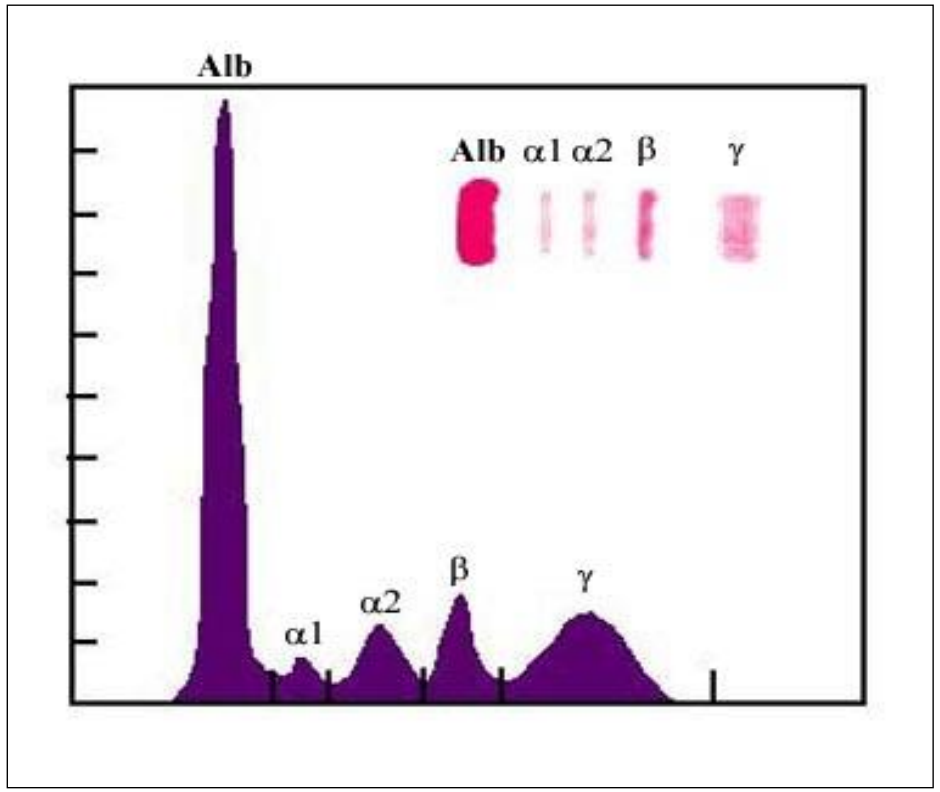
SDS (strongly anionic detergent) provides negative charge to the proteins.

SDS-PAGE


1
Denature sample with sodium dodecylsulfate
SDS-coated proteins
SDS is an ionic detergent that binds stiochiometrically to number of peptide bonds, thus separates on basis of size (MW).
2
Place mixture of proteins on gel, apply electric field
Partially separated proteins
Cross-linked polyacrylamide gel
Direction of migration
3
Stain to visualize separated bands
Decreasing size

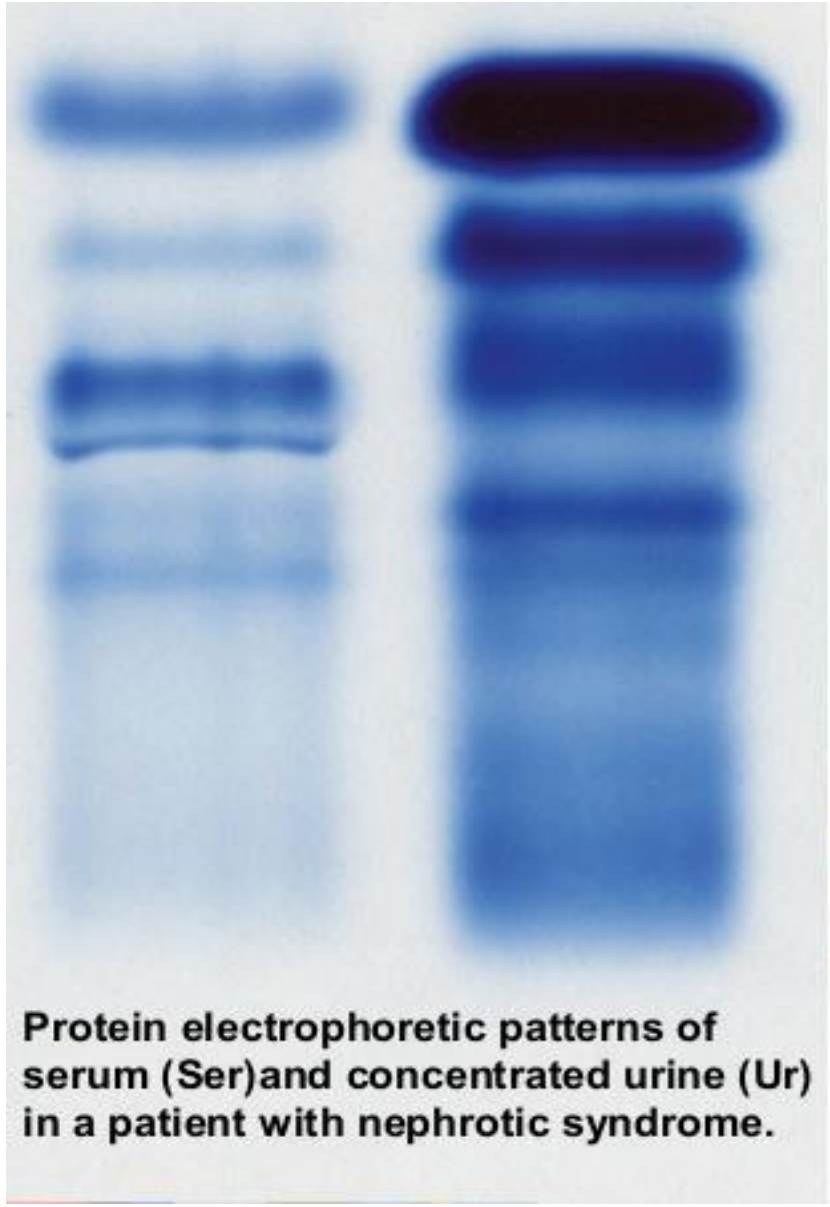
Serum proteins electrophoresis in diagnostics of diseases

Normal pattern

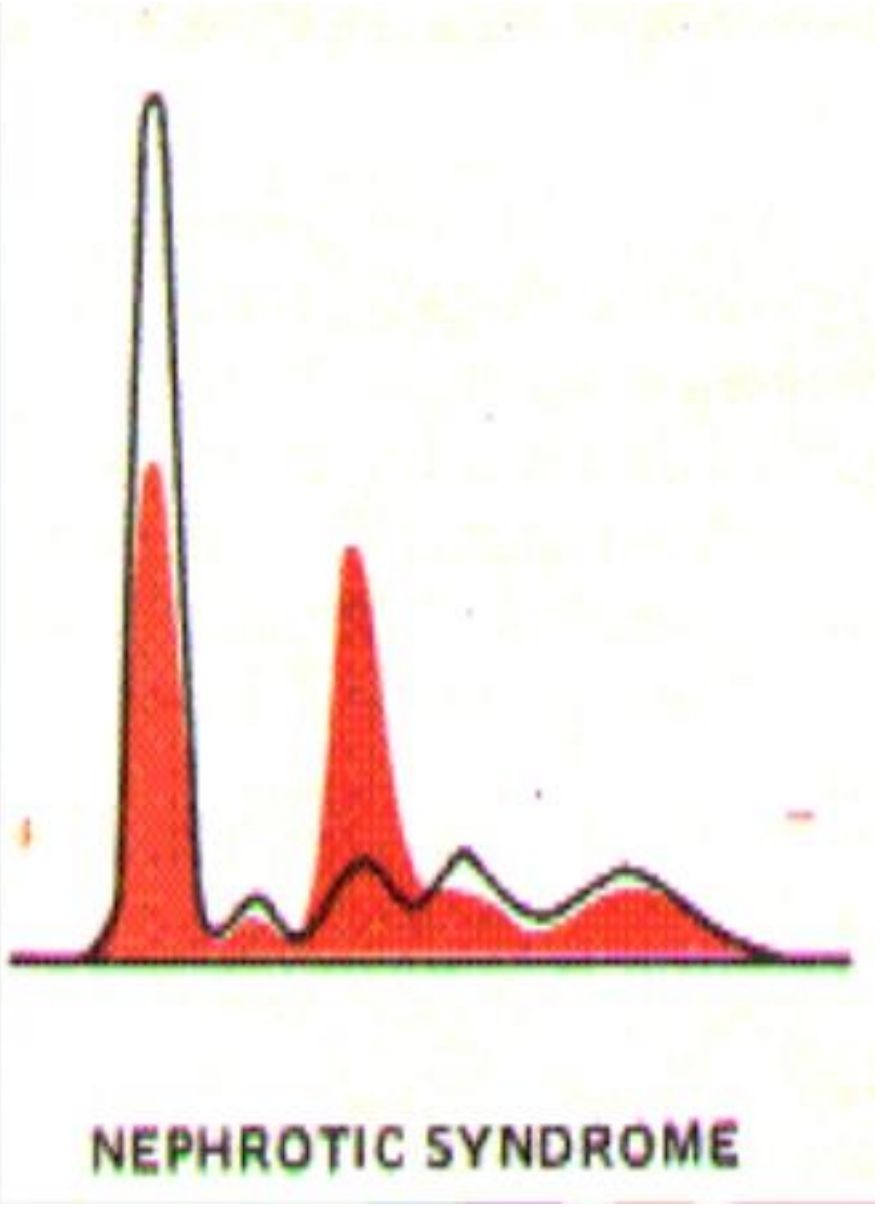


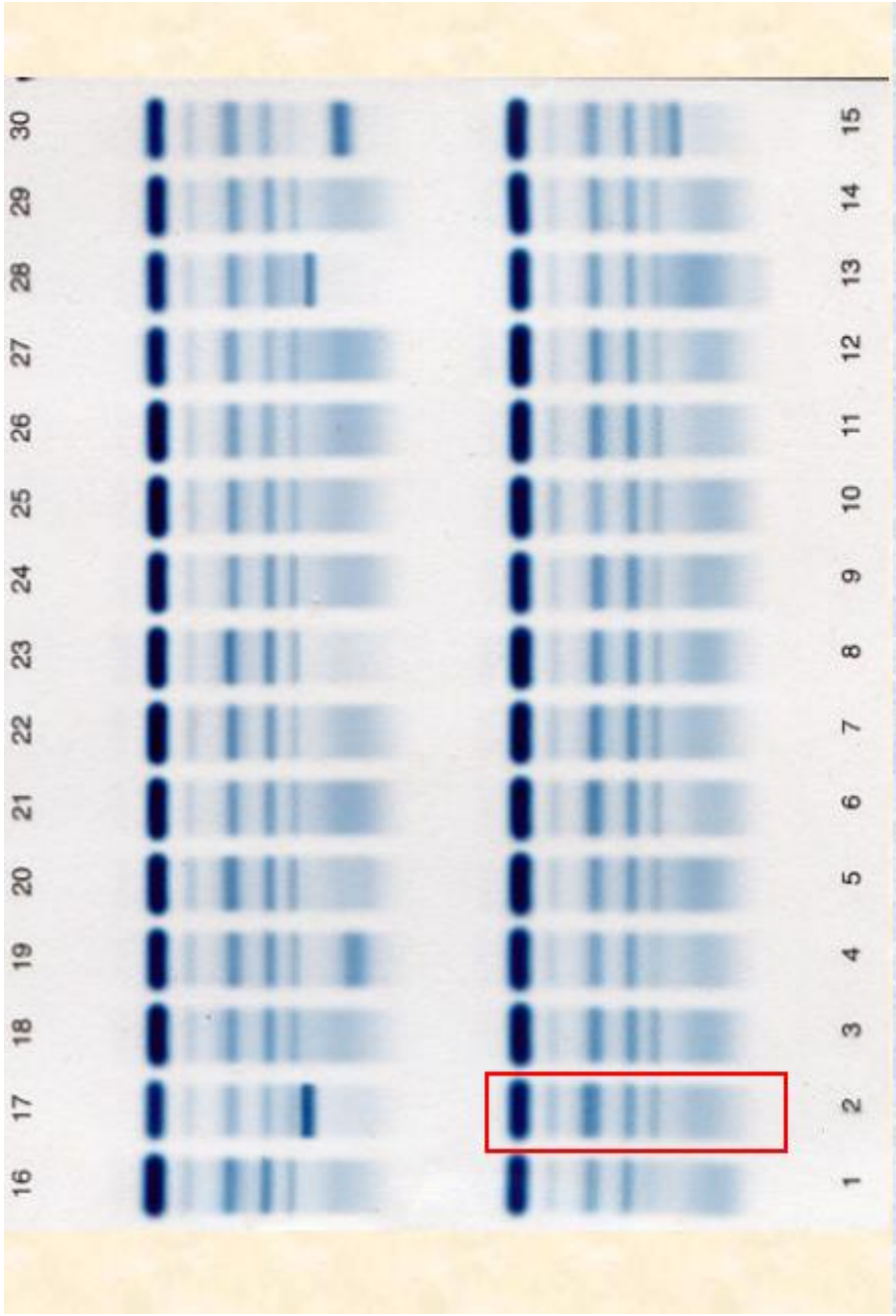
Reference ranges:

Total protein	6.0 – 8.0 g/dL
Albumin	3.5 – 5.0 g/dL
α1-globulins	0.1 – 0.4 g/dL
α2-globulins	0.4 – 1.3 g/dL
β-globulins	0.6 – 1.3 g/dL
γ-globulins	0.6 – 1.5 g/dL



Protein electrophoretic patterns of serum (Ser)and concentrated urine (Ur) in a patient with nephrotic syndrome.





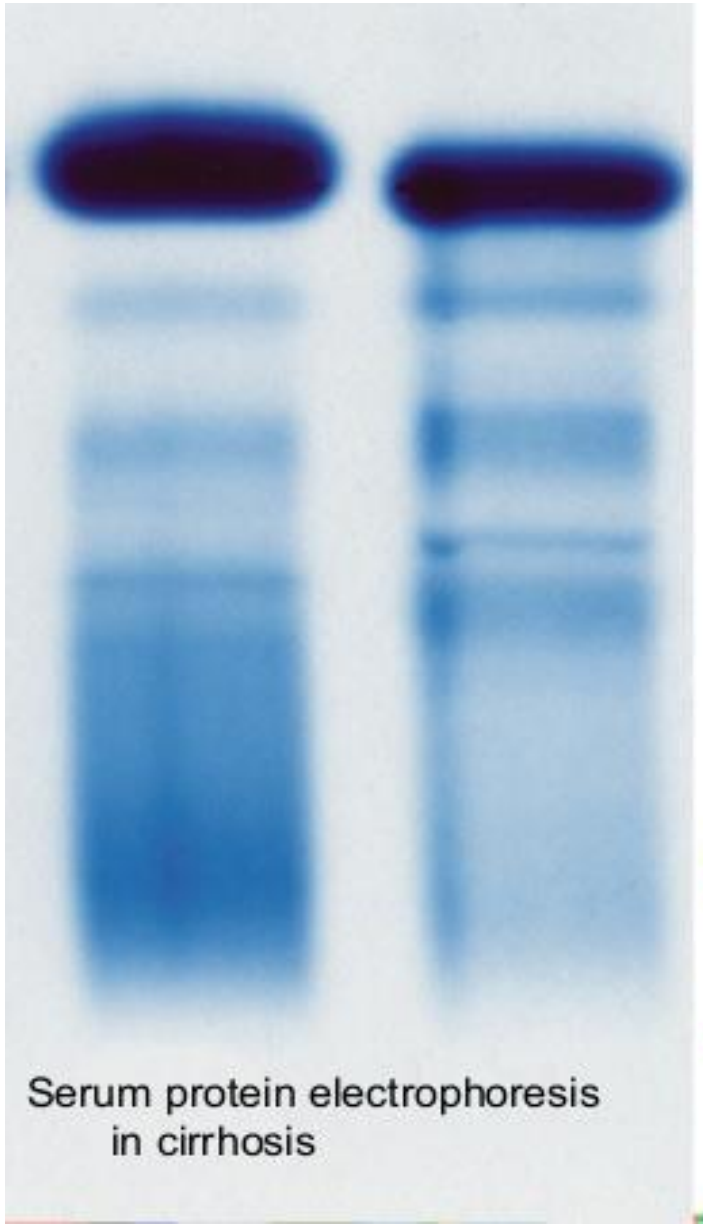
Selective protein loss

Long-term loss of albumin and IgG in kidney

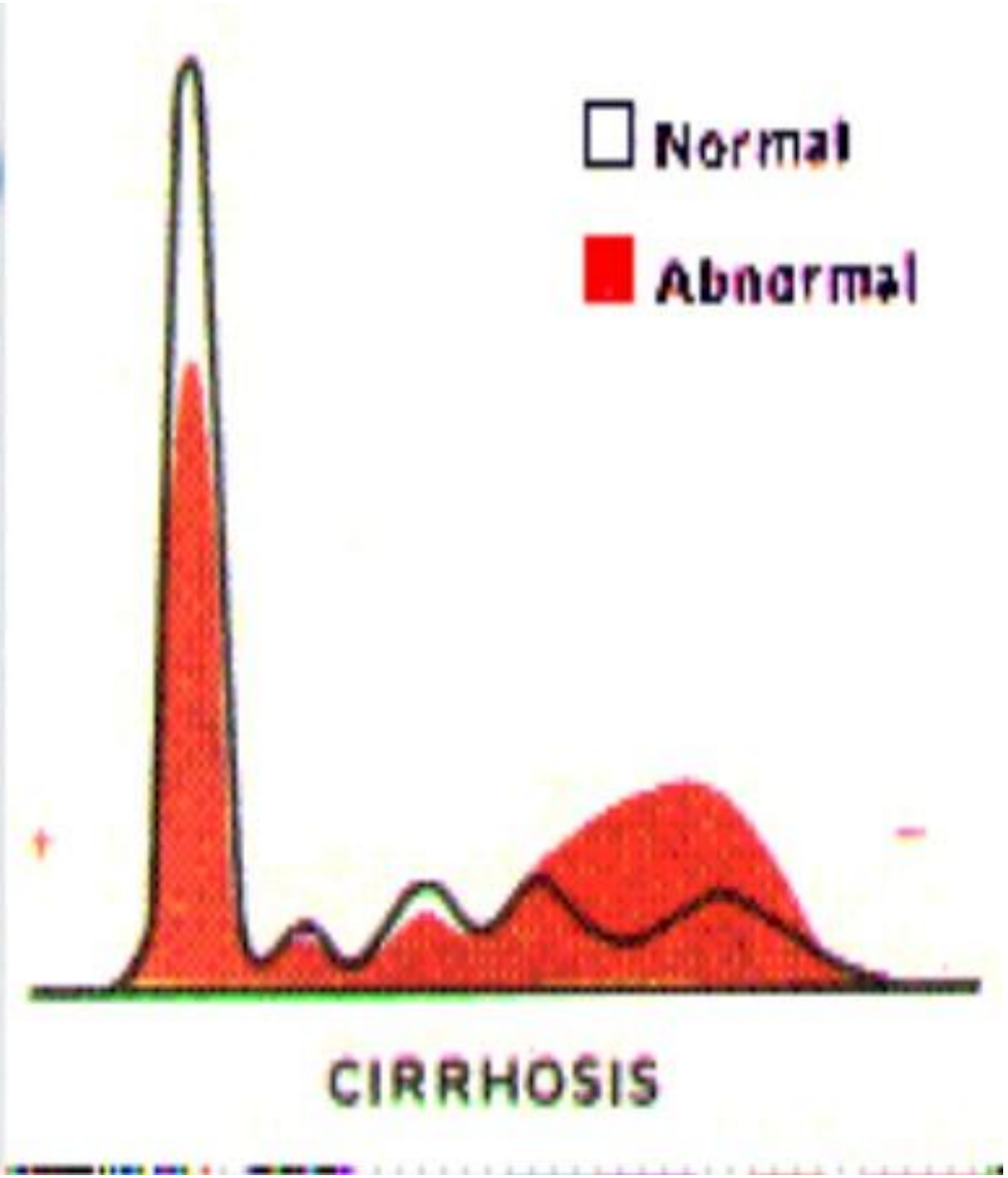
↓ albumin

↑↑ α_2 & ↑ β globulins

- nephrotic syndrome



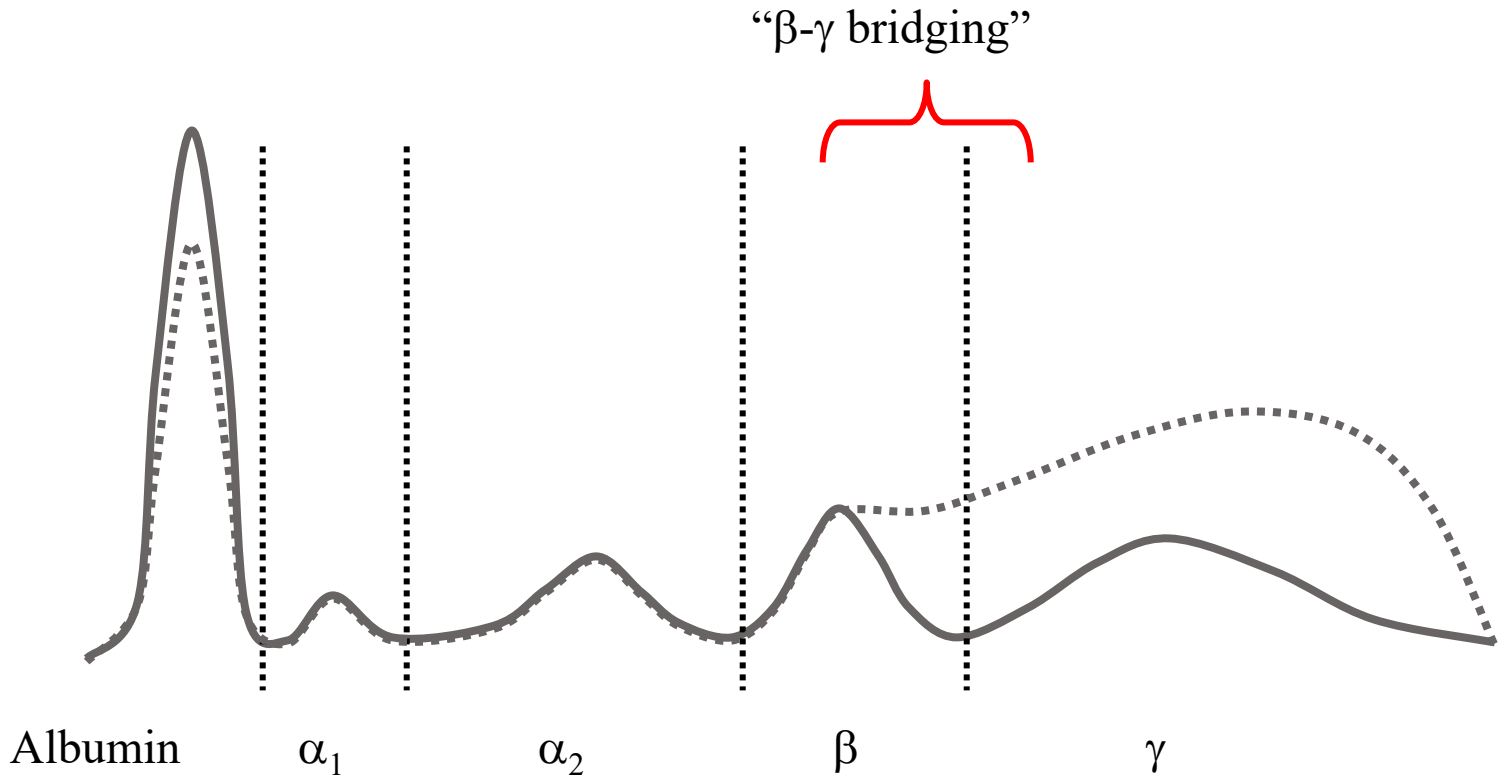
Serum protein electrophoresis
in cirrhosis

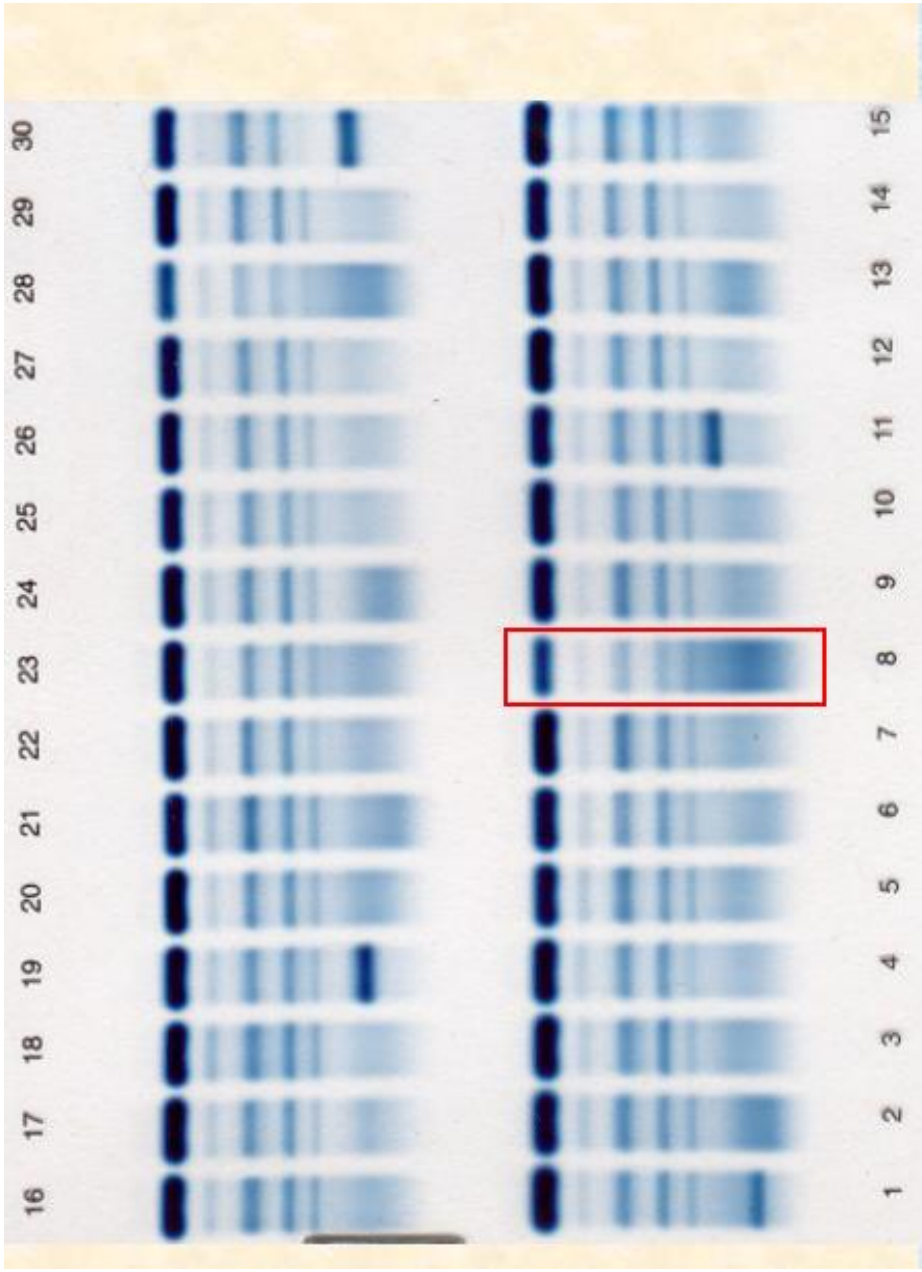


Hepatic cirrhosis

- Decreased albumin
- Increased γ globulins

Condition	Albumin	Globulins			
		α 1	α 2	β	γ
Cirrhosis	↓↓	N	N	↑	↑↑



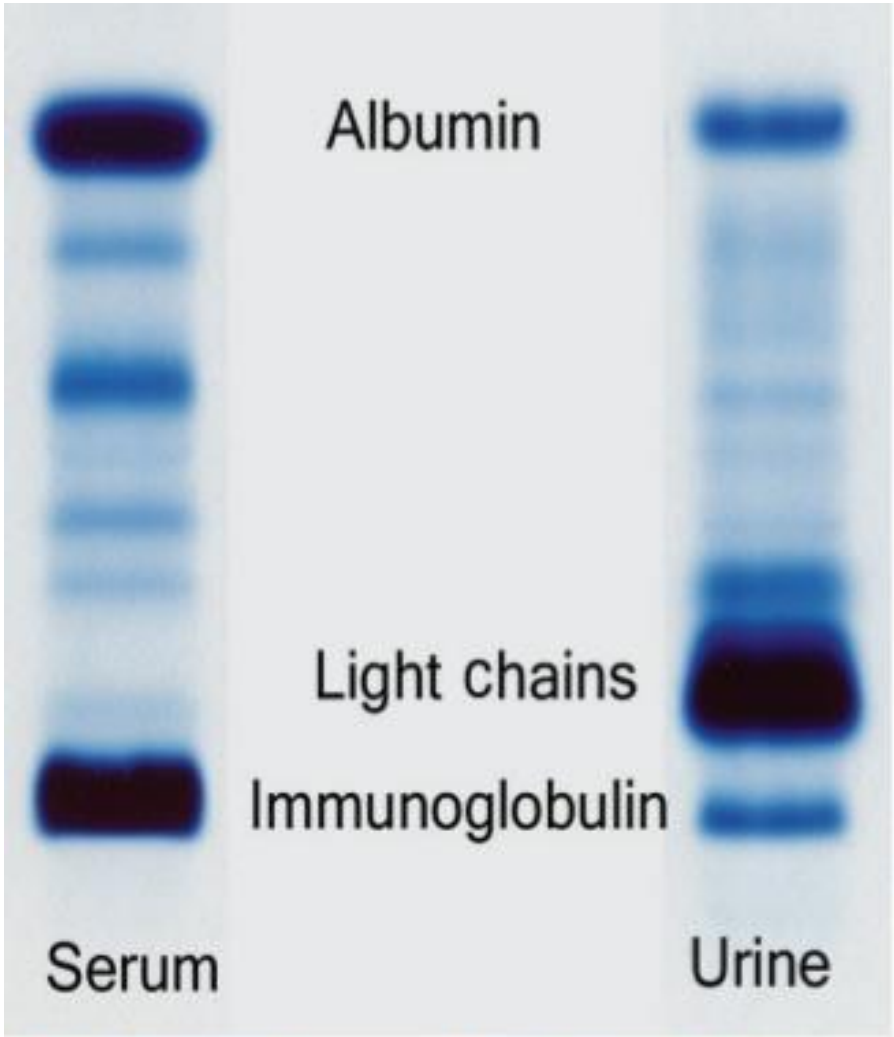


β-γ bridging

Polyclonal increase in IgA extending into beta region

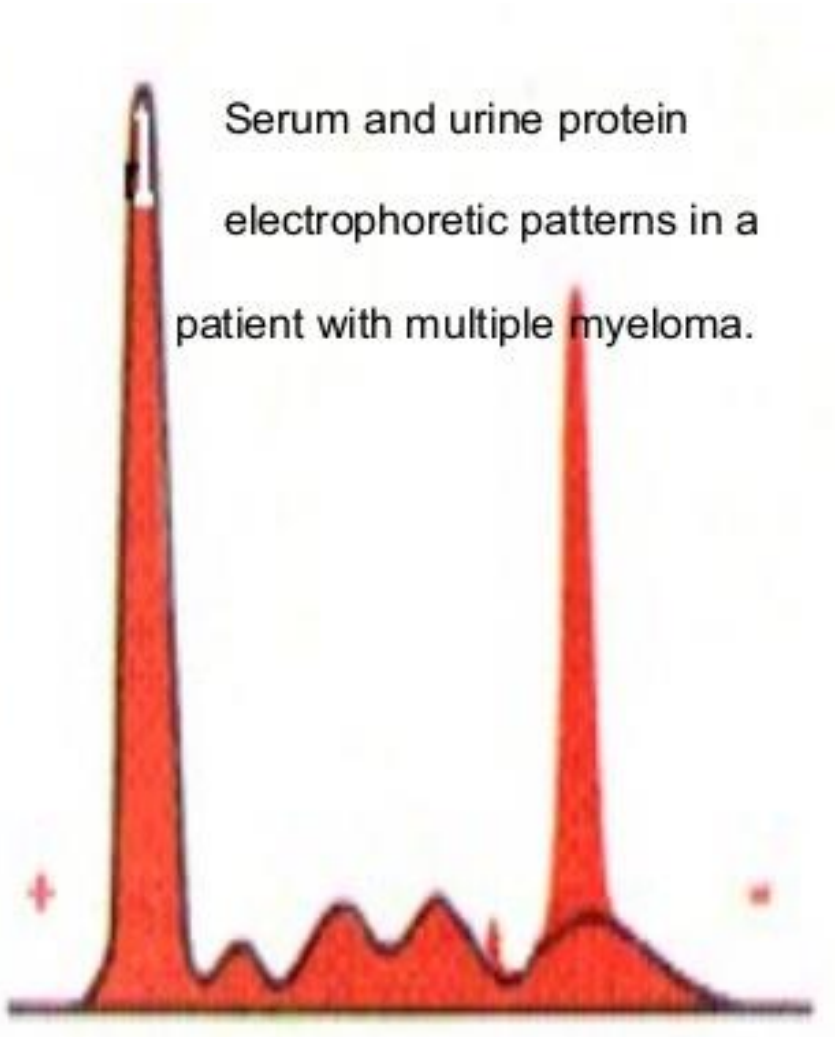
This patient also shows decreased albumin

- cirrhotic liver disease
- malignancy
- inflammatory disease



A predominance of the larger complete immunoglobulin.

A large amount of the smaller-sized light chains with only a small amount of the whole

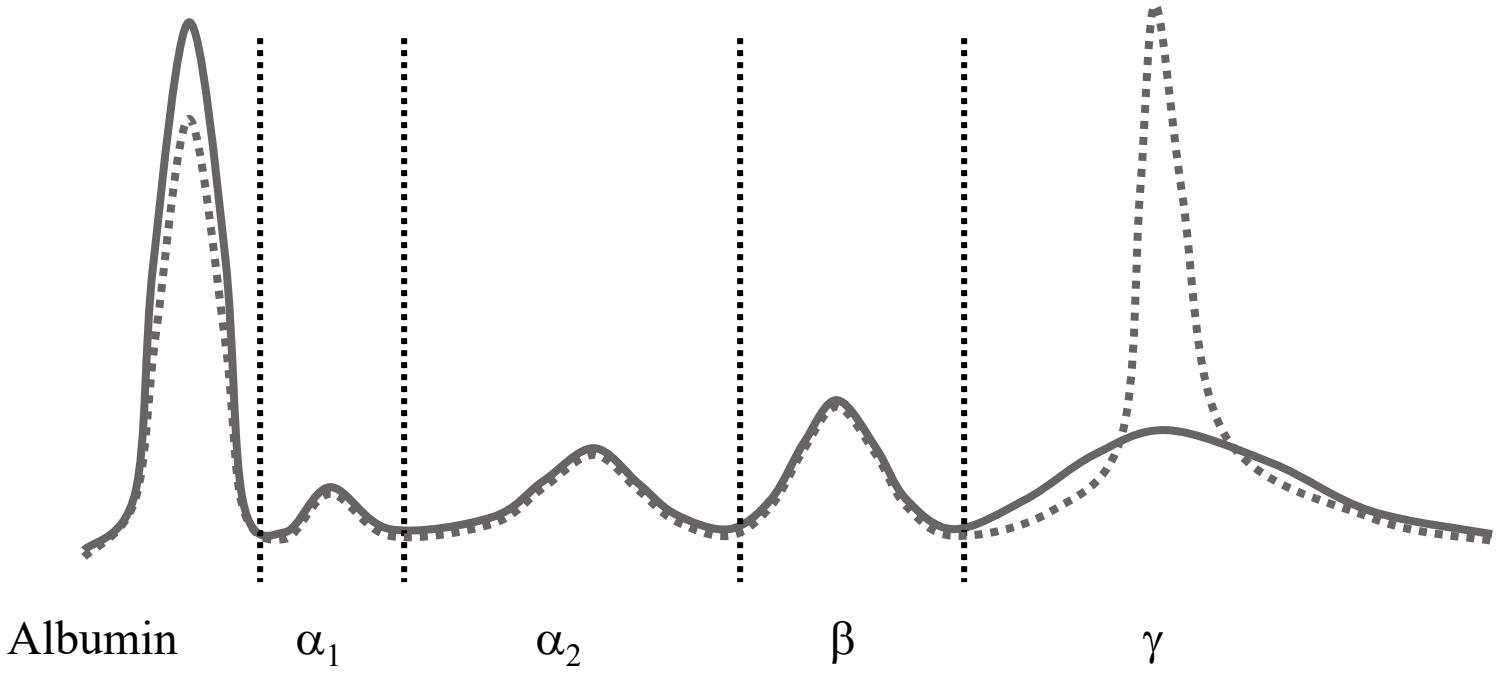


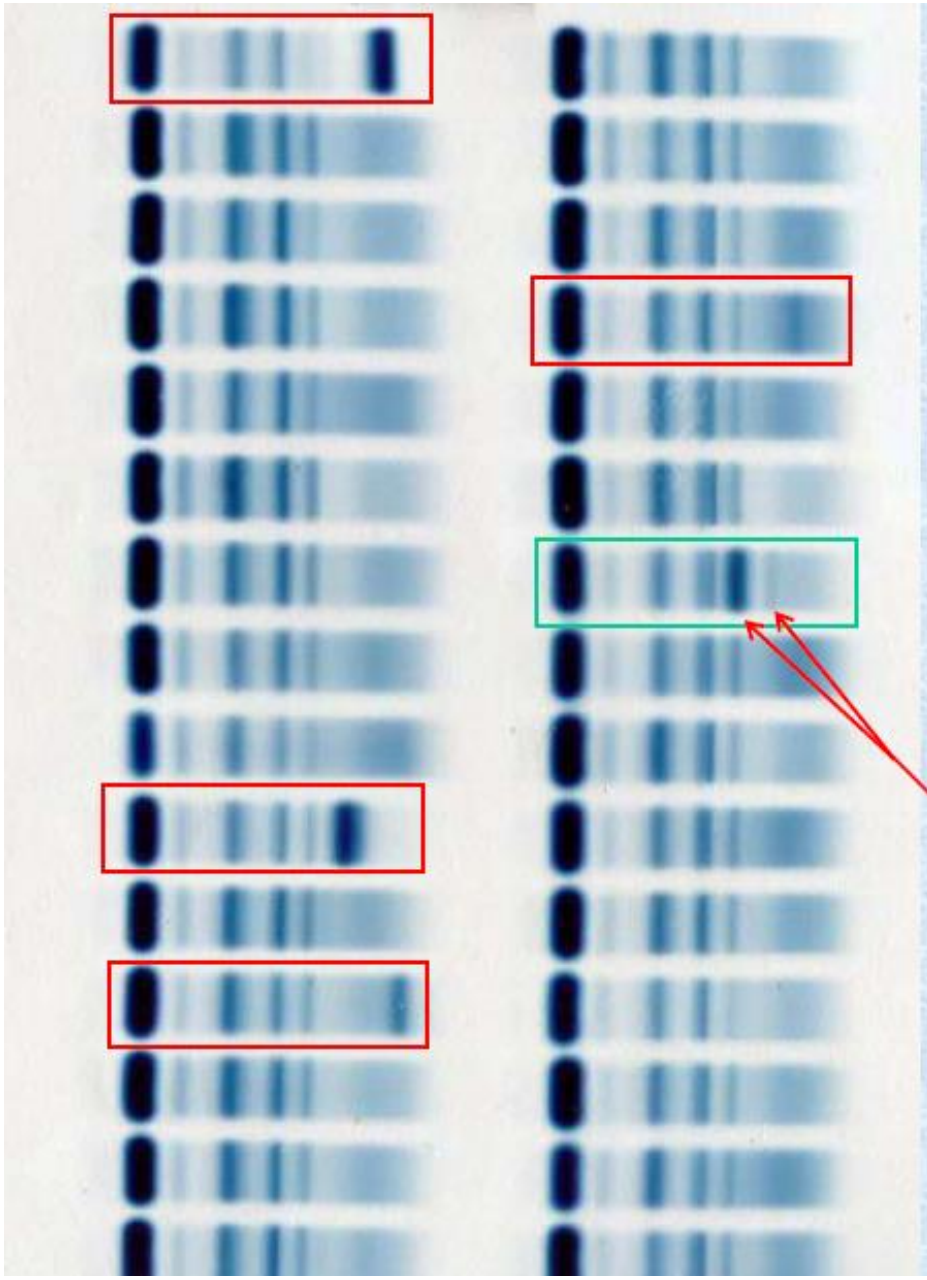
MONOCLONAL GAMMOPATHY

Monoclonal gammopathy

- Albumin decreased
- Sharp peak in γ region

Condition	Albumin	Globulins			
		α 1	α 2	β	γ
M. Myeloma	↓	N	N	N	↑↑





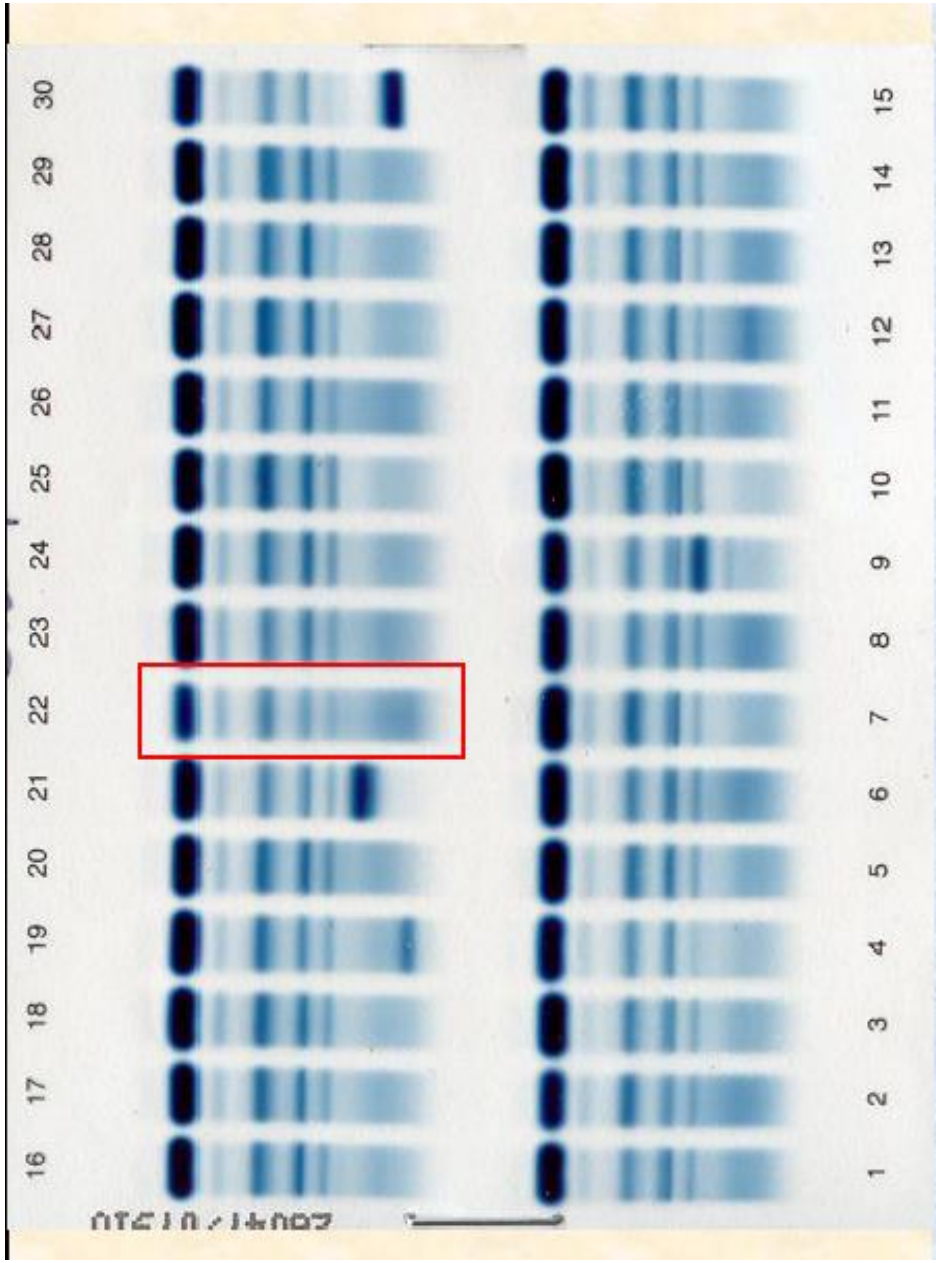
Monoclonal Gammopathy

Monoclonal proliferation of β-lymphocytes, producing an abnormal immunoglobulin paraprotein

Discrete band, typically within β - γ region

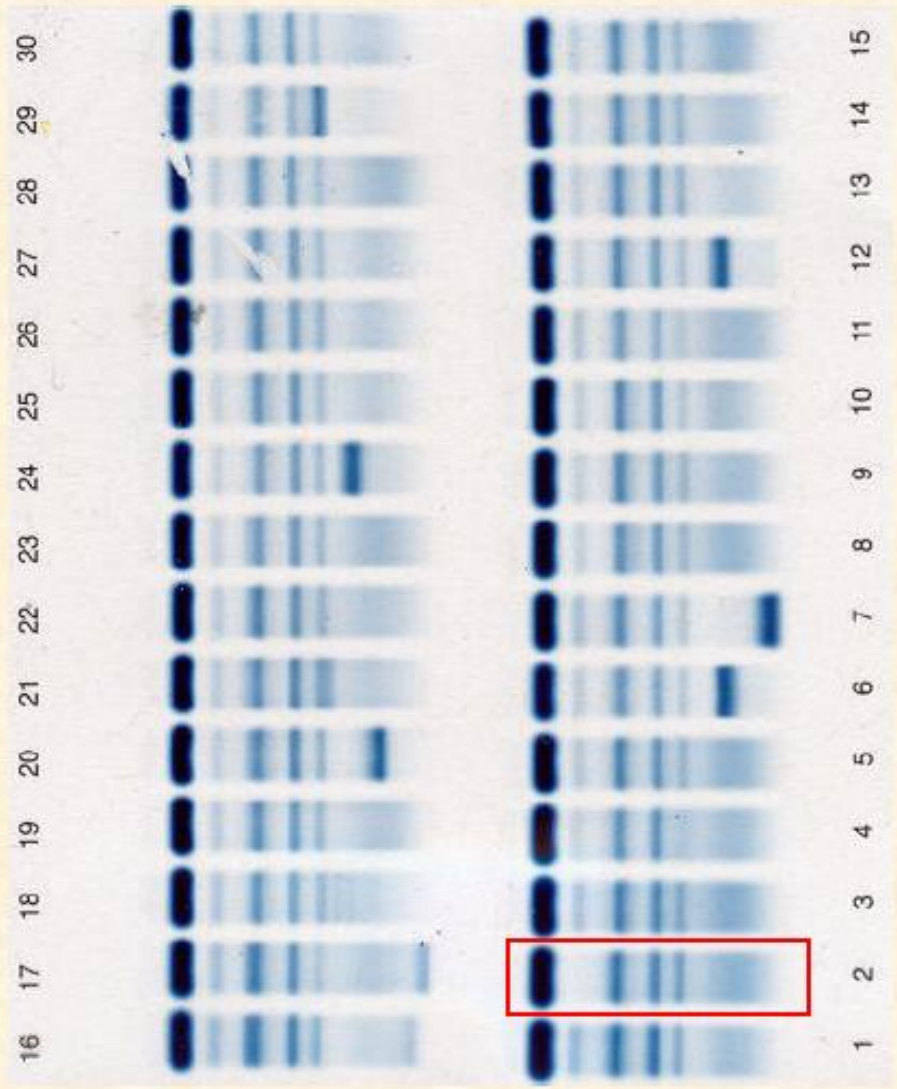
Monoclonal IgA and free light chains may migrate as far as α_2 region

example of a biclonal gammopathy



Hypoalbuminemia

- organ losses
  - renal
  - GI
- liver disease
- malnutrition



Markedly decreased alpha-1 globulins

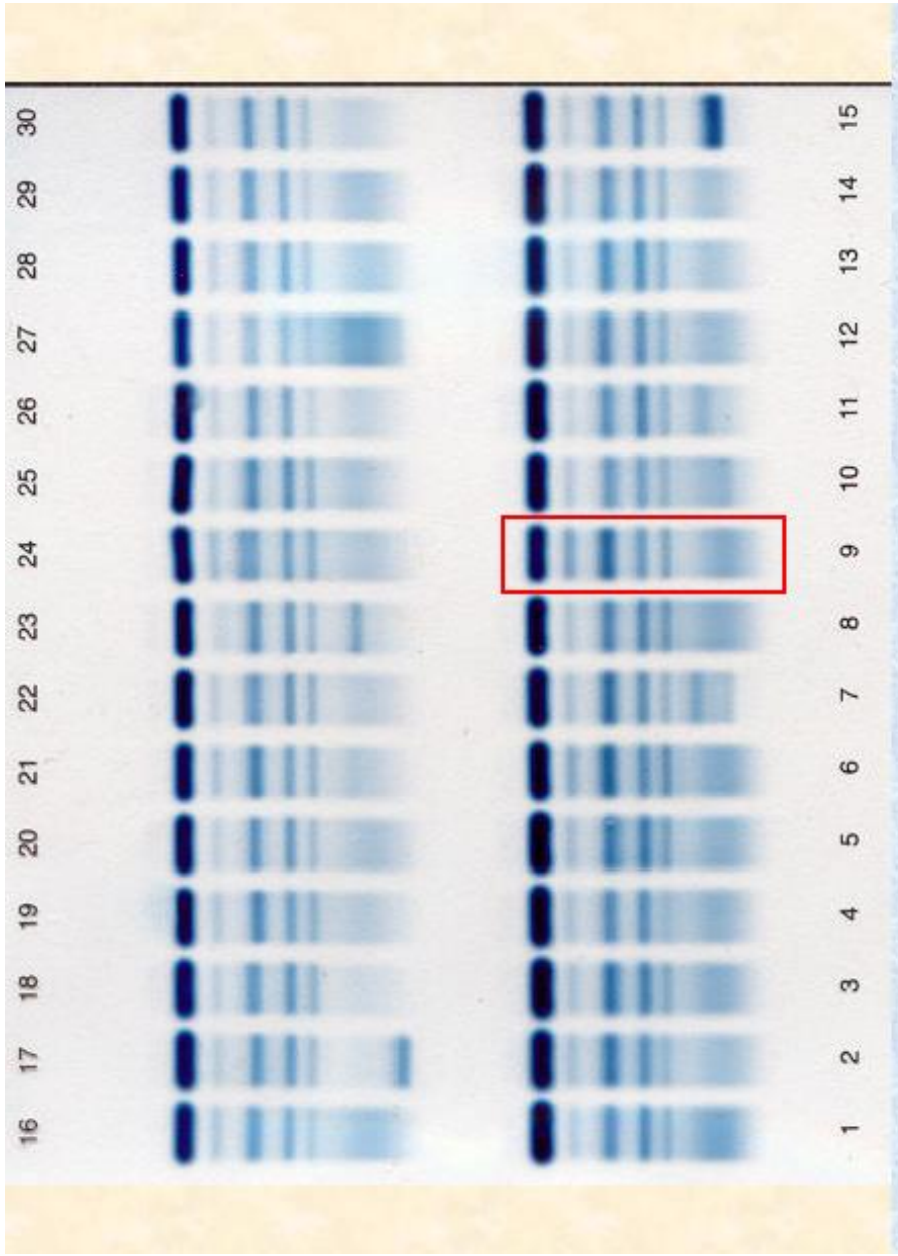
Isolated ↓ α1-AT

α1-antitrypsin deficiency

- LL ref range: 1-3 g/L
- suggest phenotyping if <0.6
- PiZZ genotype: 10% α1-AT

Combined with ↓ albumin

- liver disease
- malnutrition
- protein loss

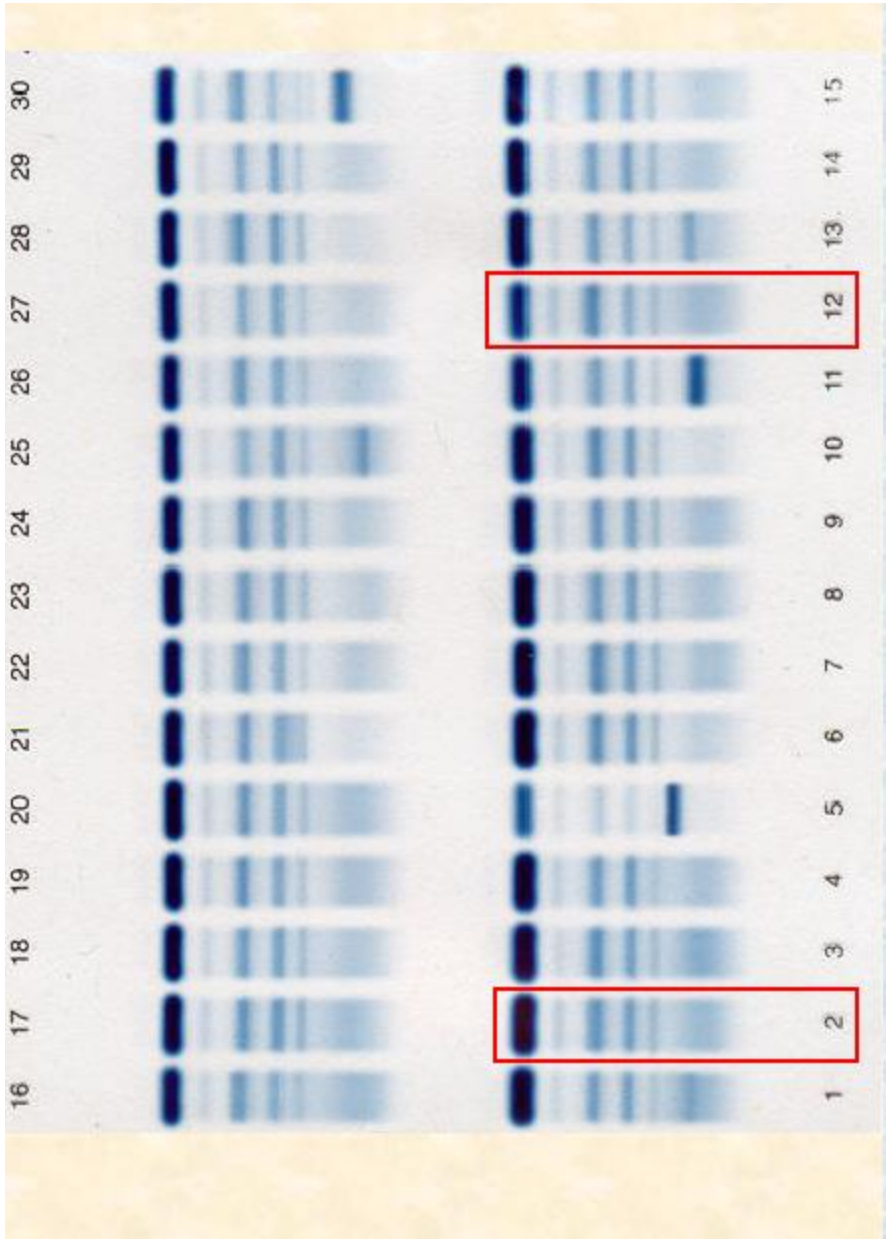


Increased alpha-2 globulins

- hemolysis
- ? monoclonal protein

Combined (eg with ↑ α1)

- acute phase response
- selective protein loss

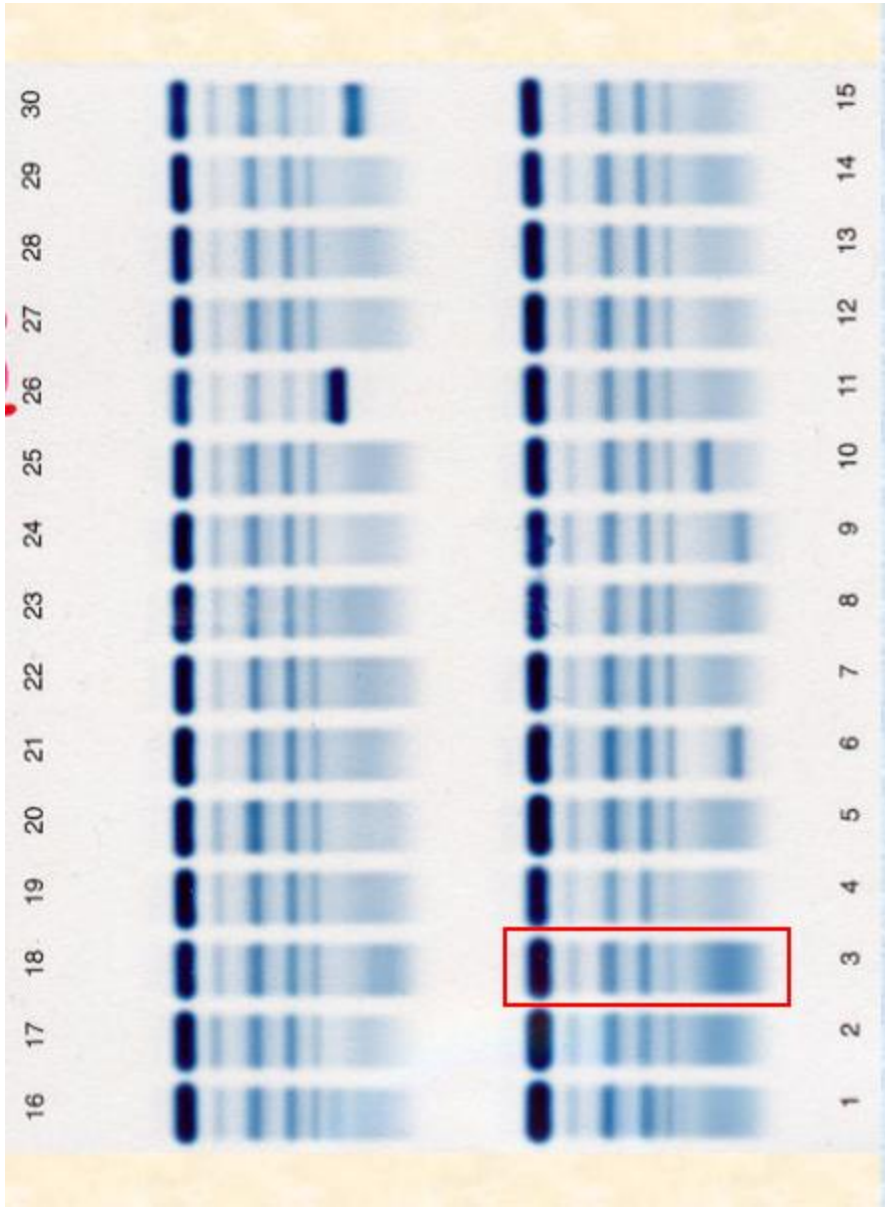


Acute inflammation

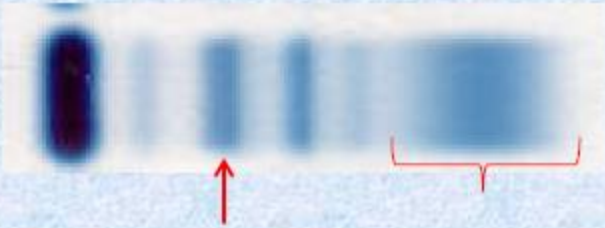
↑ α1- and ↑ α2-globulins

Often with decreased albumin, as shown in #12

- infection
- injury
- surgical trauma



Chronic inflammation



↑↑ γ-globulins

↑ α_2-globulins

± ↑ α_1-globulins

± ↓ albumin

- autoimmune disease
- chronic liver disease
- chronic infection
- malignancy

VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Department of Biochemistry

Report on Certificate course on Serum Protein Electrophoresis

Topic: Serum Protein Electrophoresis

Date: 27.05.2021

Venue: Biochemistry Demonstration Room

Target audience: Faculties and M.B.B.S., students

Number of participants: 150

Event Report: The event started with the welcome address by Dr.K.Suganthy. Following that DR. P.K. Mohanty started the lecture on serum protein electrophoresis. He explained the basics of electrophoresis and steps in performing serum protein electrophoresis and followed by this he showed a live demonstration of steps in serum protein electrophoresis and its interpretation.

Outcome: Participants should be able to do the serum protein electrophoresis by themselves and interpret the serum protein electrophoresis.

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

From

Dr. V. Raviraman
Department of Orthopaedics
Velammal Medical College Hospital and RI
Madurai

To:

The Dean
Velammal Medical College Hospital and RI
Madurai

17/12/20

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai, T.N.-625 009

Respected Sir:

We from the department of Orthopedics are planning to conduct a Certificate Courses – **"PERIARTHRITIS SHOULDER - MANAGEMENT"** on 17/12/2020 involving Ortho posting M.B.B.S Students & CRRIs. We kindly request you to give permission to conduct the same. Kindly do the needful.

Thanking You

Date: 02.12.2020

Yours sincerely,

Place: Madurai

Dr. V. Raviraman
Head of the Department

VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Department of Orthopaedics

Certificate Course

Topic: Periarthritis Shoulder - Management

Date : 17/12/2020,

Time : 11.00 am to 01.00 pm

Venue : Ortho Opd Demo Hall

Participant's List

Sl.No	Faculty Name
1.	Dr. V. Raviraman
2.	Dr. S. Shanmuganathan
3.	Dr. Ganesan G Ram
4.	Dr. K. N. Subramanian
5.	Dr. M. Subbiah
6.	Dr. R. Hari sudhan
7.	Dr. Muthu kumar . S
8.	Dr. S. Lokesh Kumar
9.	Dr. E. Vijaya raja
10.	Dr. M.J. Krishna kumar
11.	Dr. S. Dheepan Kumar
12.	Dr. V Janarthanan
	PG'S
1.	Dr. Gokul Kumar
2.	Dr. Jesmick ponniah
3.	Dr. Swathikaa
Final Year MBBS Students	
1.	Aadit Krishna N
2.	Aarira Krishnan
3.	Adlin Trinita
4.	Aishwarya S
5.	Ajay S
6.	Ajay Shankar
7.	Akash G

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

8.	Amina Marwa Sabreen
9.	Ashwin H
10.	Christina Reshma
11.	Dharshini Baskaran
12.	Dharshini Priya
13.	Divya S
14.	Divya Bharathi K
15.	Gayathri H
16.	Gayathri S
17.	Gayathri S
18.	Gopika M
19.	Gopika P
20.	Gowshikan P
21.	Gowsika A
22.	Grace Elsa Jogy
23.	Ijaz Mohammed
24.	Ilakkia N
25.	Induja S

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

VELAMMAL MEDICAL COLLEGE HOSPITAL & RESEARCH INSTITUTE

DEPARTMENT OF ORTHOPAEDICS

CERTIFICATE COURSE

TOPIC: PERIARTHRITIS SHOULDER - MANAGEMENT

DATE : 17/12/2020, TIME : 08.30 AM TO 04.30 PM VENUE : ORTHO OPD DEMO HALL

PARTICIPANT'S LIST

S.NO	FACULTY NAME	Signature
1	Dr.V.Raviraman	
2	Dr.S.Shanmuganathan	
3	Dr.V.Ramar	
4	Dr.Ganesan G Ram	
5	Dr.M.Subbiah	
6	Dr.N.J.Reguvaran	
7	Dr.M.Mithran	
8	Dr.S.Muthukumar	
9	Dr.K.N.Subramanian	
10	Dr.R.Harisudhan	
11	Dr.S.Lokesh Kumar	
12	Dr.J.Arun Prasath	
S.NO	**PG'S**	
1	Dr. Gokul Kumar	
2	Dr. Jesmick ponniah	
3	Dr. Swathikaa	
	FINAL YEAR MBBS STUDENTS	

1	AADIT KRISHNA N	
2	AARIRA KRISHNAN	
3	ADLIN TRINITA	
4	AISHWARYA S	

5	AJAY S	
6	AJAY SHANKAR	
7	AKASH G	
8	AMINA MARWA SABREEN	
9	ASHWIN H	
10	CHRISTINA RESHMA	
11	DHARSHINI BASKARAN	
12	DHARSHINI PRIYA	
13	DIVYA S	
14	DIVYA BHARATHI K	
15	GAYATHRI H	
16	GAYATHRI S	
17	GAYATHRI S	
18	GOPIKA M	
19	GOPIKA P	
20	GOWSHIKAN P	
21	GOWSIKA A	
22	GRACE ELSA JOGY	
23	IJAZ MOHAMMED	
24	ILAKKIA N	
25	INDUJA S	

Dr. RAVI RAMAN
Orthopedic Dept.
VMCH & RI
Madurai-625 009

Department of Orthopaedics

VELAMMAL HOSPITAL
the healing touch

Certificate Course

Title:

Periarthritis Shoulder – Management

Date: 17.12.2020

Day: Thursday

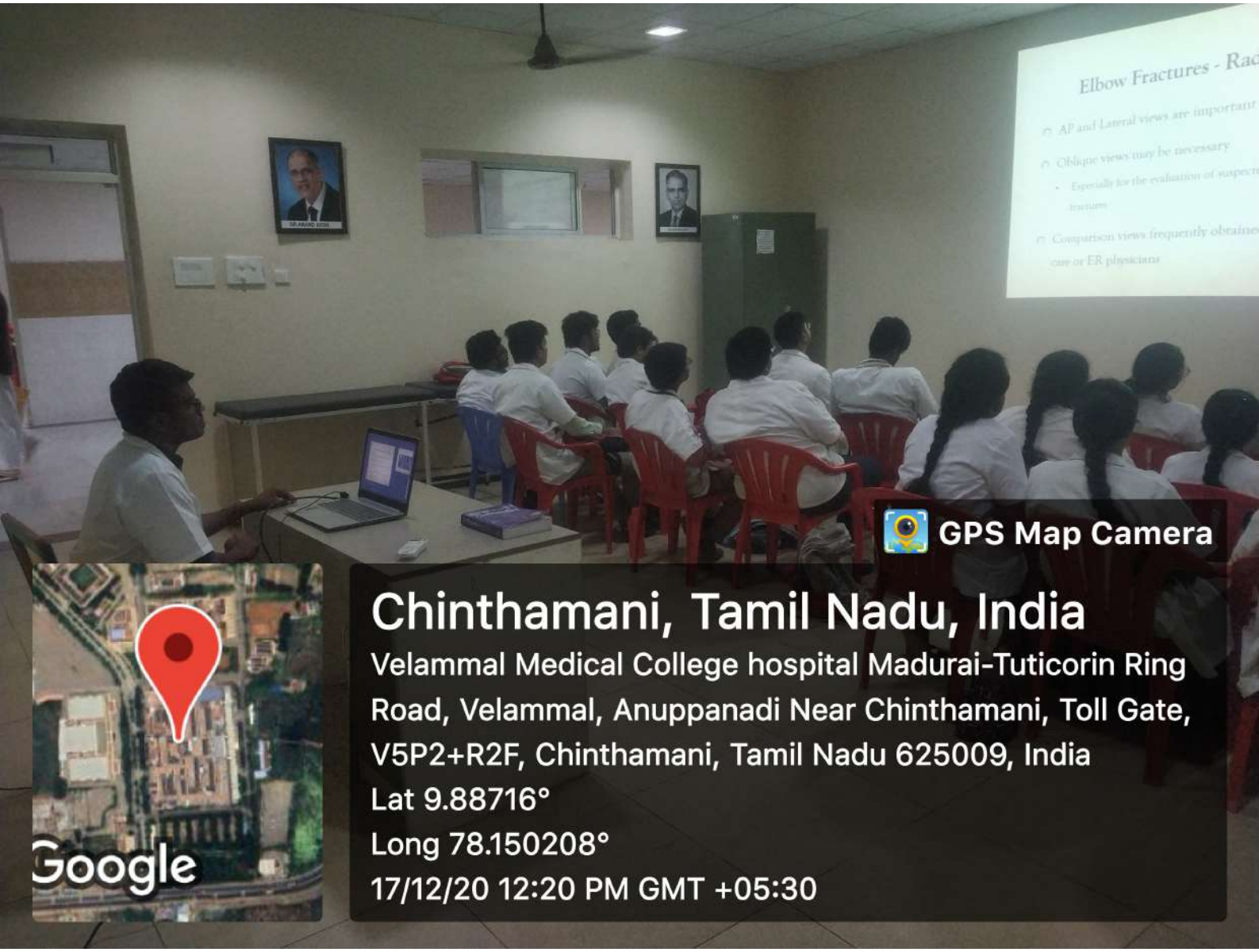
Venue: Lecture Hall

Duration: 8 hours

AGENDA

TIME	TOPIC	SPEAKER
8.30 am to 09.00 am	Introduction	Dr. E. Vijayaraja
9.00 am to 11.00 am	Assessment	Dr. M. J. Krishna kumar
11.00 am to 01.00 pm	Physical therapy	Dr. Dheepan kumar
01.00 pm to 01.30 pm	Lunch	
01.30 pm to 03.30 pm	MUA/ Arthroscopic capsular release	Dr. Ganesan G Ram
03.30 pm to 04.30 pm	Complications	Dr. Hari sudhan

Teaching method power point presentation, interactive discussion


Elbow Fractures - Rad
AP and Lateral views are important
Oblique views may be necessary
Especially for the evaluation of suspect
fractures
Comparison views frequently obtained
care or ER physicians
GPS Map Camera
Chinthamani, Tamil Nadu, India
Velammal Medical College hospital Madurai-Tuticorin Ring Road, Velammal, Anuppanadi Near Chinthamani, Toll Gate, V5P2+R2F, Chinthamani, Tamil Nadu 625009, India
Lat 9.88716°
Long 78.150208°
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ORTHOPAEDICS
GPS Map Camera
Chinthamani, Tamil Nadu, India
Velammal Medical College hospital Madurai-Tuticorin Ring Road, Velammal, Anuppanadi Near Chinthamani, Toll Gate, V5P2+R2F, Chinthamani, Tamil Nadu 625009, India
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Name of the Event
GPS Map Camera
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Velammal Medical College hospital Madurai-Tuticorin Ring Road, Velammal, Anuppanadi Near Chinthamani, Toll Gate, V5P2+R2F, Chinthamani, Tamil Nadu 625009, India
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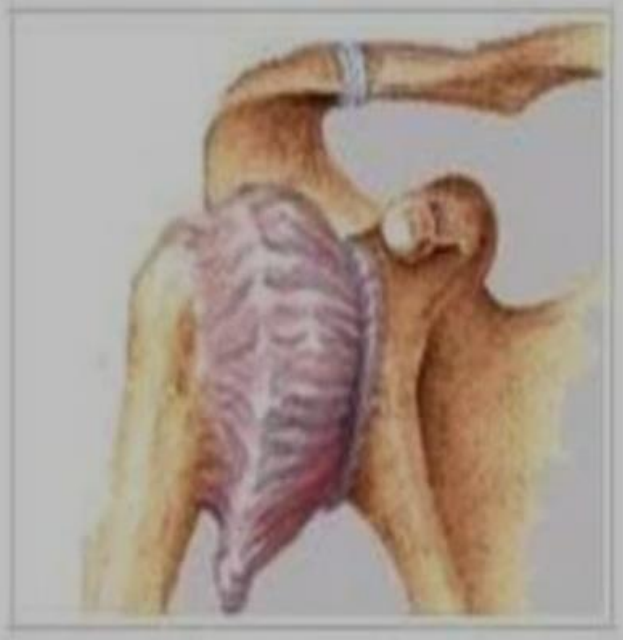
PERIARTHRITIS SHOULDER

DR K N SUNBRAMANIAN

DEFINITION

- Peri arthritis Shoulder is a condition in which there is inflammation of tissues around the joint capsule. The Gleno- humeral joint (that is the shoulder joint) becomes painful and stiff.



INTRODUCTION

- The periarthritis of shoulder also called as **adhesive capsulitis or Frozen shoulder,** is a chronic, inflammatory disorder of the shoulder and surrounding soft tissues.
- This condition is frequently caused by injury, leading to pain and lack of use.

As the **joint becomes progressively tighter and stiffer**, simple movements, such as raising the arm, become difficult.

Age and Sex

- **People 40 and older** are more likely to experience frozen shoulder

- More **common in women** (especially in postmenopausal women) than men

Endocrine abnormalities such as:

- **Diabetes**
- Hyperthyroidism

Systemic diseases

- Heart disease
- Parkinson's disease

SYMPTOMS

- Painful shoulder
- Stiffness in shoulder
- Difficulty to reach overhead
- at all times and all the movements of shoulder are severely limited.

FROZEN SHOULDER IS CLASSICALLY CHARACTERIZED BY THREE STAGES

- **Stage 1** – The **painful/freezing stage.** There is usually a dull, aching pain onset of predominantly nocturnal pain, usually without a precipitating factor.
- The pain is not related to activity, although the end range of motion can increase the pain.
- As the disease progresses, patients have pain at rest which lasts 2-9 months, ROM is not restricted.

- **Stage 2** – This is known as the **adhesive/frozen stage**.

- The shoulder typically becomes increasingly stiff, daily activities such as grooming one's hair, reaching for a seatbelt, ove becomes difficult.

- Although the pain does not normally get worse, the muscles may start to waste slightly as they are not being used.

- **Stage3 -** This is the **recovery/thawing stage** in which you gradually regain movement of the shoulder.
- The pain also fades, although it may recur from time to time as the stiffness eases.
- Although it is possible that you may not regain full movement of your shoulder, you will be able to do many more tasks than previous stage.
- This stage can last any period of time from five months to 3-4 years.

DIAGNOSIS

- X-rays—a test that uses radiation to take pictures of structures inside the body, to rule out other possible causes of the stiffness
- MRI scan—a test that uses magnetic radiation waves to make pictures of the tissues in the body, used to examine the soft tissues around the shoulder
- Arthrograms—x-ray pictures taken after dye is injected into the shoulder area. This test is difficult to perform with this shoulder condition.

Surgery

- Surgery is an option if there is no improvement after 4 to 6

months of intensive therapy. Surgeries include:

Closed manipulation:-

- This involves forceful movement of the arm at the shoulder joint to loosen the stiffness. This is performed under anesthesia and followed by intensive physical therapy.

Arthroscopic surgery

- An **arthroscope**, which is a long, thin, fiberoptic tube with a light on the end, is **inserted through a small incision in the shoulder.**
- Using this tube and other small instruments, the tightened tissues are released and the shoulder is manipulated. Physical therapy must be done after this surgery

Prevention

To help prevent frozen shoulder:

- **Do regular strength training and range of motion exercises**. This will help maintain a strong and flexible shoulder joint.

- **After any injury to the upper extremity (hand, wrist, elbow, etc), always move the shoulder through a full range of motion several times a day.**

VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Department of Orthopaedics

Report

Topic : Certificate course on Periarthritis Shoulder - Management

Date : 17.12.2020

Venue : Ortho OPD Demo Hall, VMCH & RI

Target Audience : Final year students

Number of participants: 25

A certificate course on **Periarthritis Shoulder - Management** Was organised by Department of Orthopaedics to Final year students on 17.12.2020. 25 Final year students participated in the course. The program began by 08.30 am with a pretest followed by Introduction, Assessment, Physical therapy, MUA, Arthroscopic capsular release, Complications. The program concluded with a vote of thanks. Pretest and posttest were conducted to sensitize the students with topic content and grade their knowledge gain of the course.

Outcome:

Students learnt about the concepts of Periarthritis shoulder – management. The gained idea about Periarthritis shoulder - management

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

From

Dr. V. Raviraman
Department of Orthopaedics
Velammal Medical College Hospital and RI
Madurai

To:

The Dean
Velammal Medical College Hospital and RI
Madurai

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anupparadi, Madurai, T.N.-625 009

Respected Sir:

We from the department of Orthopedics are planning to conduct a Certificate Courses – **"PHYSIOTHERAPY - ROLE IN ORTHO"** on 04/01/2021 involving Ortho posting M.B.B.S Students & CRRIs. We kindly request you to give permission to conduct the same. Kindly do the needful.

Thanking You

Date: 21.12.2020

Yours sincerely,

Place: Madurai

Dr. V. Raviraman
Head of the Department

VELAMMAL MEDICAL COLLEGE HOSPITAL & RESEARCH INSTITUTE

DEPARTMENT OF ORTHOPAEDICS

CERTIFICATE COURSE

TOPIC: PHYSIOTHERAPY - ROLE IN ORTHO

DATE : 04/01/2021, TIME : 08.30 AM TO 04.30 PM VENUE : ORTHO OPD DEMO HALL

PARTICIPANT'S LIST

S.NO	FACULTY NAME	Signature
1	Dr. V. Raviraman	
2	Dr. S. Shanmuganathan	
3	Dr. Ganesan G Ram	
4	Dr. K. N. Subramanian	
5	Dr. M. Subbiah	
6	Dr. R. Hari sudhan	
7	Dr. Muthu kumar . S	
8	Dr. S. Lokesh Kumar	
9	Dr. E. Vijaya raja	
10	Dr. M.J. Krishna kumar	
11	Dr. S. Dheepan Kumar	
12	Dr. V Janarthanan	
S.NO	**PG'S**	
1	Dr. Gokul Kumar	
2	Dr. Jesmick ponniah	
3	Dr. Swathikaa	
	PRE FINAL YEAR STUDENTS	
1.	KAMALAKANNAN S	
2.	KARIGHA S	
3.	KARTHIK JEEVA RAM S	
4.	KARTHIKEYAN S	
5.	KAVITHA K R	
6.	KAVYA E	

Department of Orthopaedics

VELAMMAL HOSPITAL
the healing touch

Certificate Course

Title:

Physiotherapy – Role in Ortho

AGENDA

TIME	TOPIC	SPEAKER
8.30 am to 09.00 am	Introduction	Dr. S. Shanmuganathan
9.00 am to 11.00 am	Assessment	Dr. Ganesan G Ram
11.00 am to 01.00 pm	Pre & Pos operative rehabilitation	Dr. Subbiah
01.00 pm to 01.30 pm	Lunch	
01.30 pm to 02.30 pm	Evaluation	Dr. K.N. Subramanian
02.30 pm to 04.30 pm	Instruments	Dr. R. Hari sudhan

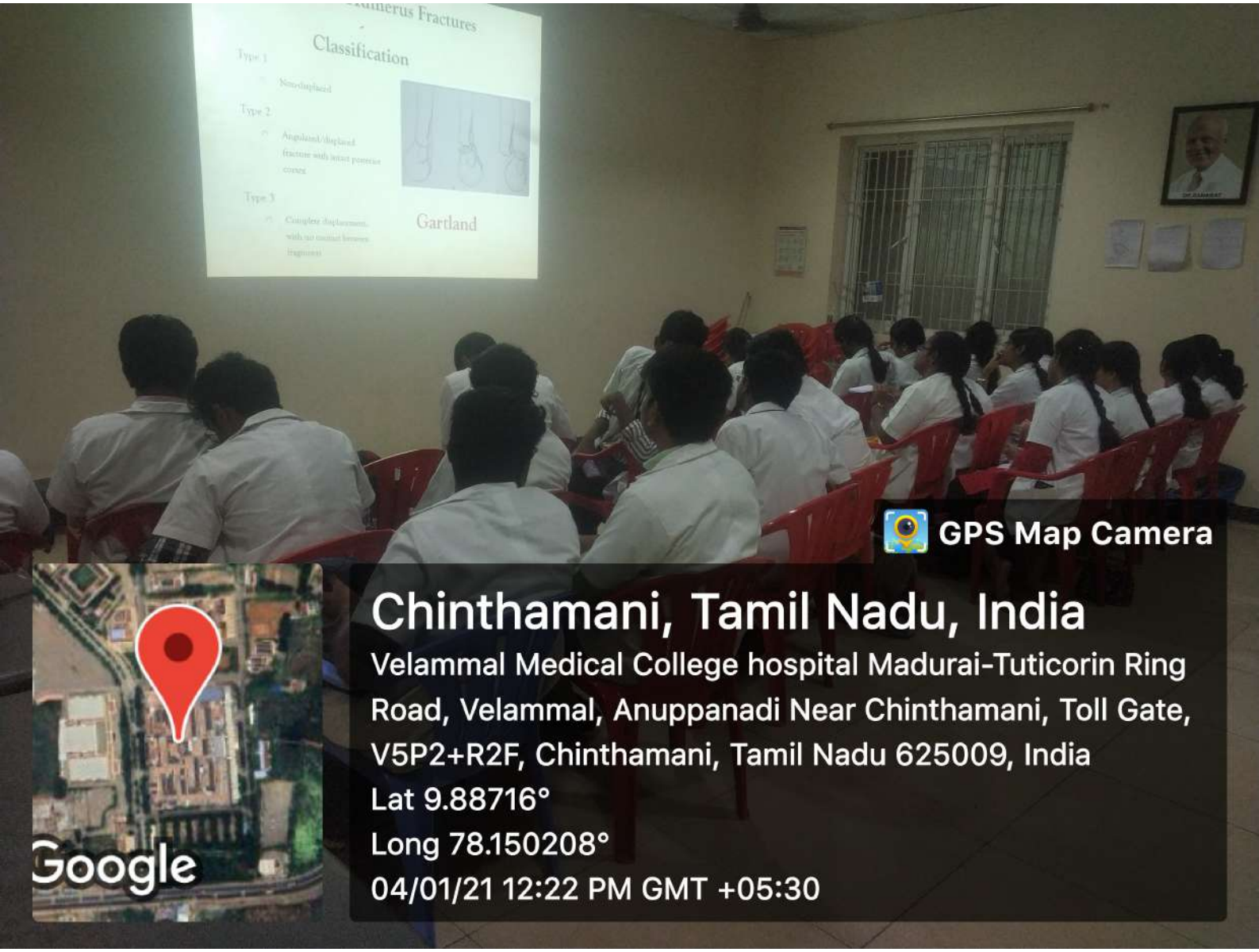
Date: 04.01.2021

Day: Monday

Venue: Lecture Hall

Duration: 8 hours

Teaching method power point presentation, interactive discussion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DEPARTMENT OF
ORTHOPAEDICS
Name of the Event :
Event Coordinator :
Date :
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Velammal Medical College hospital Madurai-Tuticorin Ring Road, Velammal, Anuppanadi Near Chinthamani, Toll Gate, V5P2+R2F, Chinthamani, Tamil Nadu 625009, India
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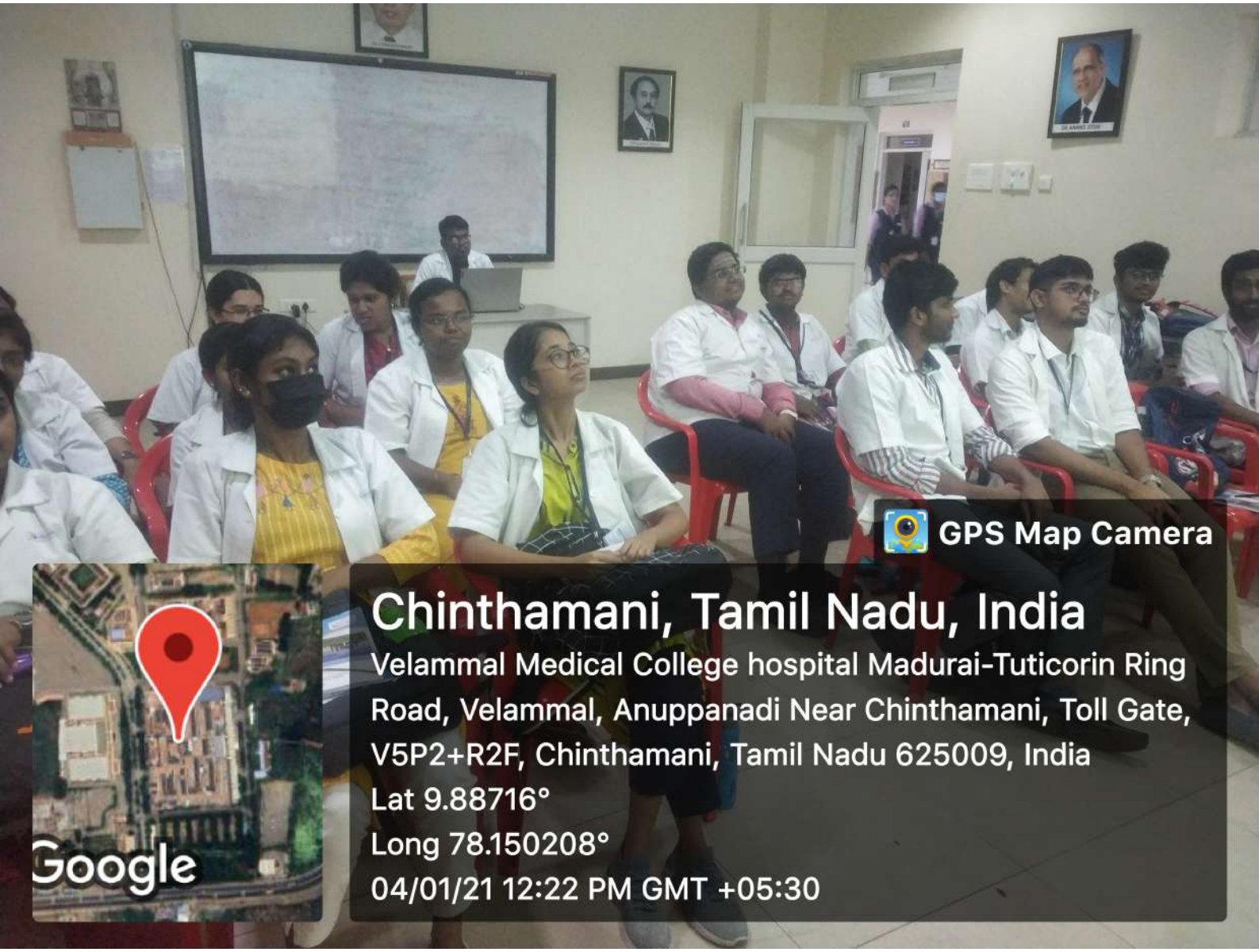
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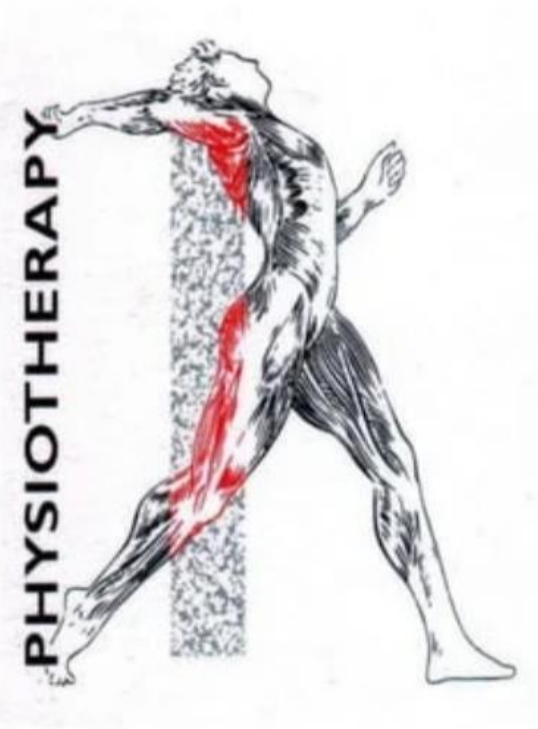
PHYSIOTHERAPY IN ORTHOPAEDICS

DR DHEEPAN KUMAR

PHYSIOTHERAPY



Physiotherapy, also referred to as physical therapy, involves evaluating, diagnosing, and treating a range of diseases, disorders, and disabilities using physical agents and exercises

Physiotherapy for Orthopaedic Patients

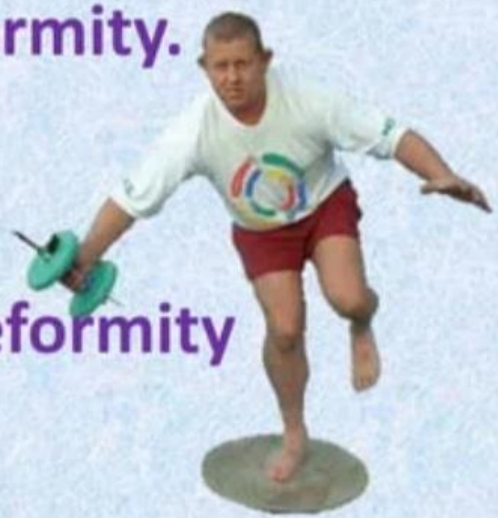
- Physiotherapy is an important part of recovery
- It is used for : pain relief, prevention of stiffness, muscle strengthening, mobilization of stiff joint or spine, training non-weight bearing or partial weight bearing
- Physiotherapy modalities include: heat, cold, exercise, ultrasound, traction, electrical stimulation

Role Of Physiotherapist

- Assess ,manage & treat a broad range of medical conditions from sprained ankle to strokes.
- Relieve physical pain & heal injuries.
- Increase mobility, build strength, improve balance & enhance Cardiopulmonary performance.
- Use a variety of techniques to maintain the property of muscles & joints.
- Make individual independent for his/ her activity of daily living.
- Provides gait training & Posture correction.

• Aims

- To treat disability and deformity.
- To correct disability and deformity
- To prevent disability and deformity



OUT PATIENT PHYSIOTHERAPY

- SHORT WAVE DIATHERMY
- ULTRA SOUND THERAPY
- WAX THERAPY
- MOIST HEAT
- INTERFERENTIAL THERAPY
- TENS
- TRACTION
- EXERCISE THERAPY-ROM-STRENGTHENING

Rehabilitation

- All fracture may not needs reduction or retention but all fractures need rehabilitation.

GAIT TRAINING


STAGES OF PHYSIOTHERAPY
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VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Department of Orthopaedics

Report

Topic : Certificate course on Physiotherapy - Role In Ortho

Date : 04.01.2021

Venue : Ortho OPD Demo Hall, VMCH & RI

Target Audience : Prefinal year students

Number of participants: 25

A certificate course on Physiotherapy - Role In Ortho was organised by Department of Orthopaedics to Prefinal year students on 04.01.2021. 25 Prefinal years students participated in the course. The program began by 08.30 am with a pretest followed by Introduction, Assessment, pre & post operative rehabilitation, Evaluation & instruments. The program concluded with a vote of thanks. Pretest and posttest were conducted to sensitize the students with topic content and grade their knowledge gain of the course.

Outcome:

Students learnt about the concepts of Physiotherapy - Role In Ortho. The gained idea about Physiotherapy - Role In Ortho.

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

VELAMMAL MEDICAL COLLEGE
HOSPITAL & RESEARCH INSTITUTE

DEPARTMENT OF RADIODIAGNOSIS

DOPPLER IN OBSTETRICS

CERTIFICATE COURSE

VELAMMAL MEDICAL COLLEGE HOSPITAL & RESEARCH INSTIUTE

DOPPLER IN OBSTETRICS

CERTIFICATE COURSE

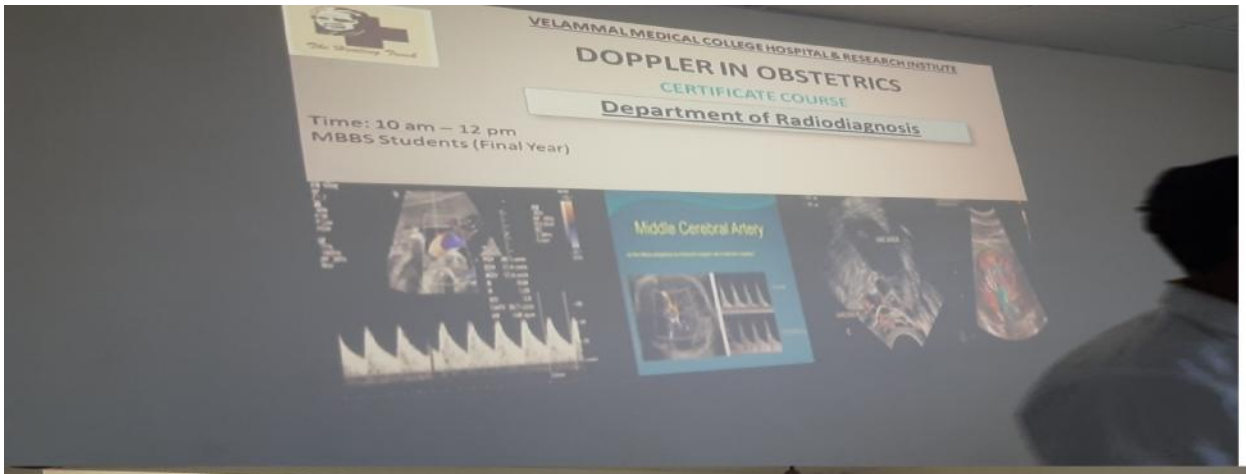
Department of Radiodiagnosis

Date: 15.12.2020
Time: 10 am – 12 pm

Radiology Post Graduates
Bsc Radiology & Imaging Technology Students

DEPARTMENT OF RADIODIAGNOSIS
CERTIFICATE COURSE –DOPPLER IN OBS
15.12.2020

S.No	Name	Mobile Number	Signature
1.	Vibin.V		Vib.V.
2.	Sharad Eswar R		
3.	G.S.V. Rishi Rahul		
4.	B.K.Tharun		
5.	M.Sriram		M.Shiram
6.	Vishwanth Kumar.R		
7.	Sarath Aravindh N		
8.	Sanjay Baalachandran R		
9.	Shaalini.L		Shaalini
10.	T.Shamila Nandhini		
11.	Shyam Cumar		
12.	R.Sindudevi		Sindu
13.	R. SMRITI		
14.	Suba Harini		
15.	B.T. Surya Krishna		Suryakrishna
16	Sushma. JBS		
17.	N. Suvesha		
18.	P. Swarna Gowri		
19	Swastika Balaji		Swastika Balaji
20	Swathi M		
21.	S.Thayada Sundaram		S.Thayada
22.	Varsha. S		S. Varsha


VELAMMAL MEDICAL COLLEGE HOSPITAL & RESEARCH INSTITUTE
DOPPLER IN OBSTETRICS
CERTIFICATE COURSE
Department of Radiodiagnosis
Time: 10 am – 12 pm
MBBS Students (Final Year)
Middle Cerebral Artery


DOPPLER IN OBSTETRICS
Department of Radiodiagnosis
Middle Cerebral Artery


Department of Radiodiagnosis
Middle Cerebral Artery

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VELAMMAL MEDICAL COLLEGE HOSPITAL & RESEARCH INSTITUTE
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OPPLER IN OBSTETRICS
CERTIFICATE COURSE
Department of Radiodiagnosis


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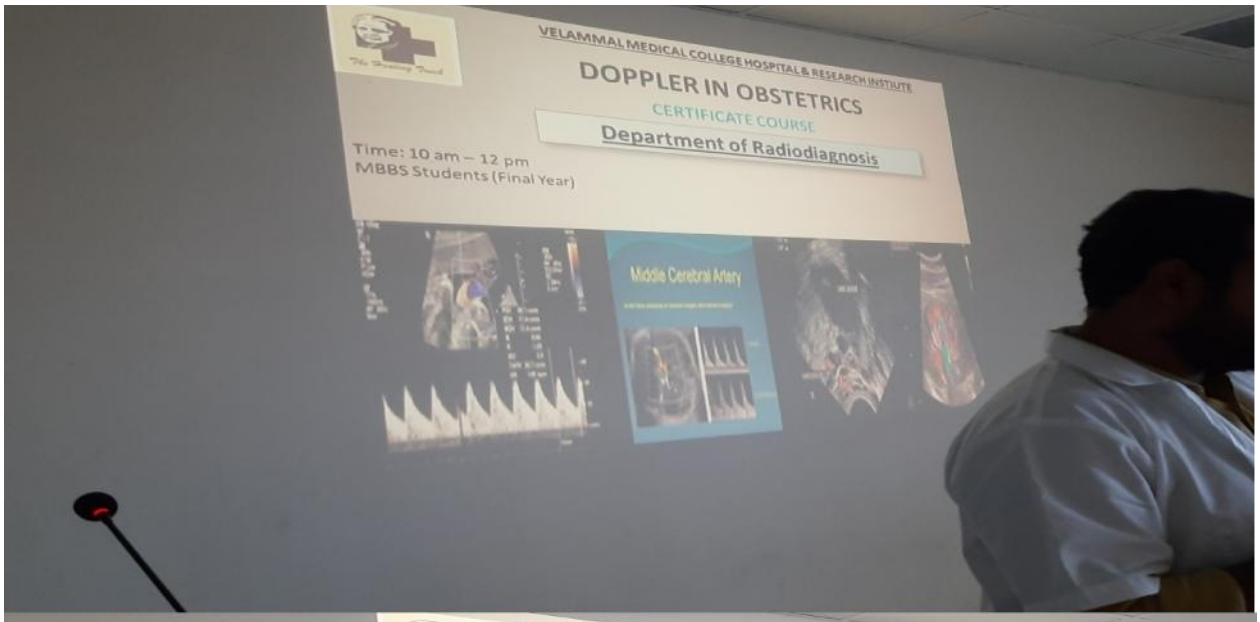
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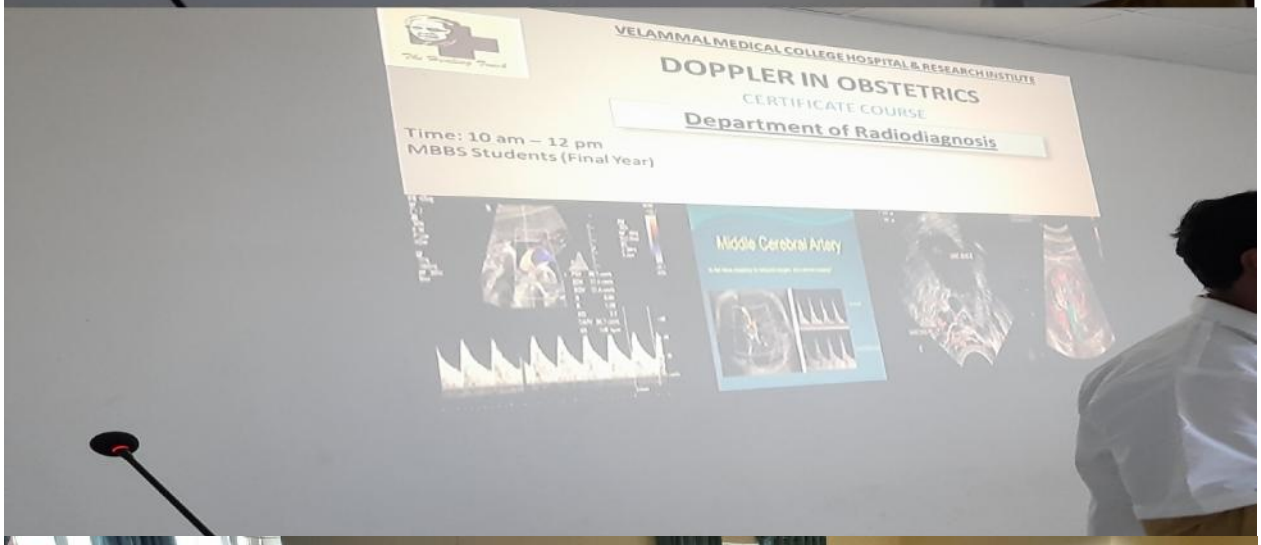
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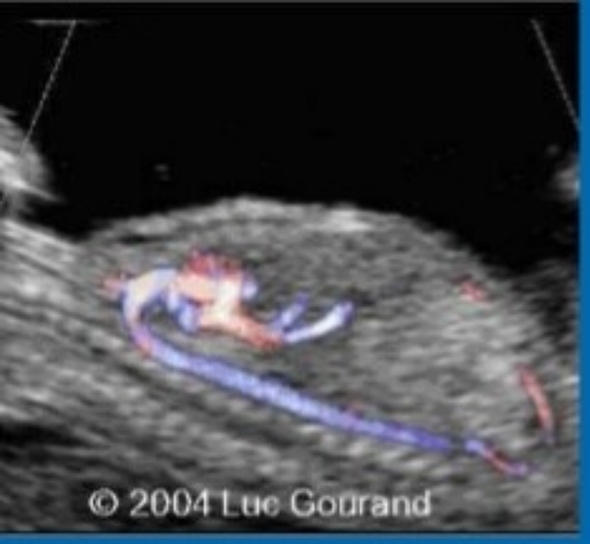
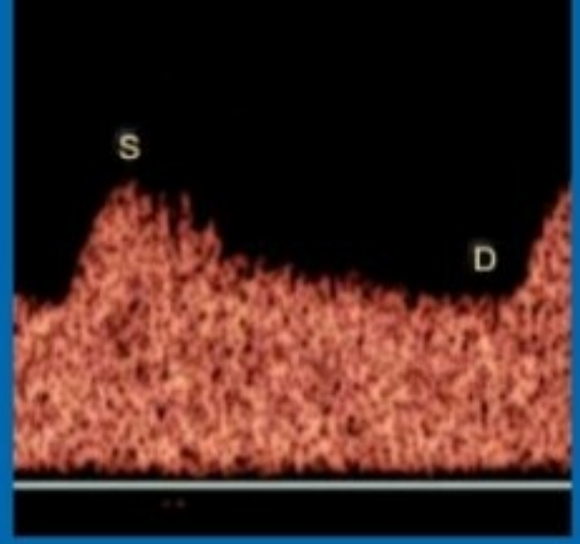
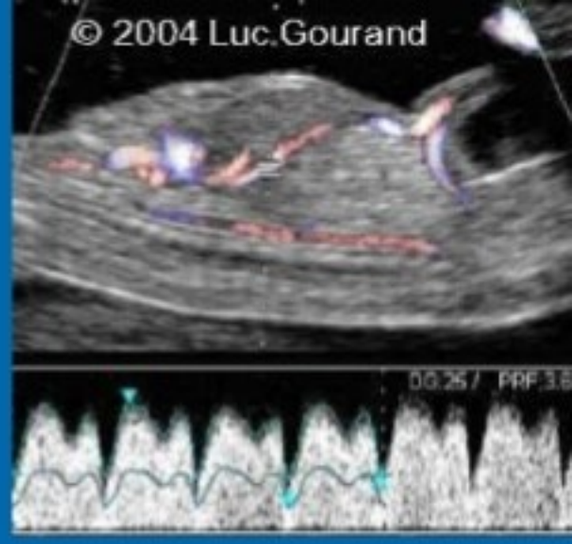
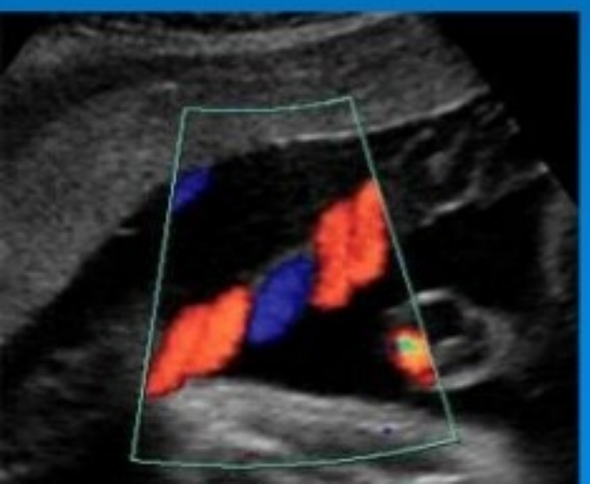
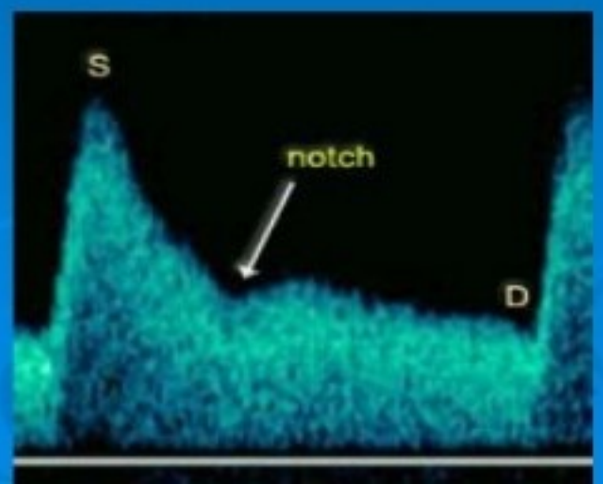


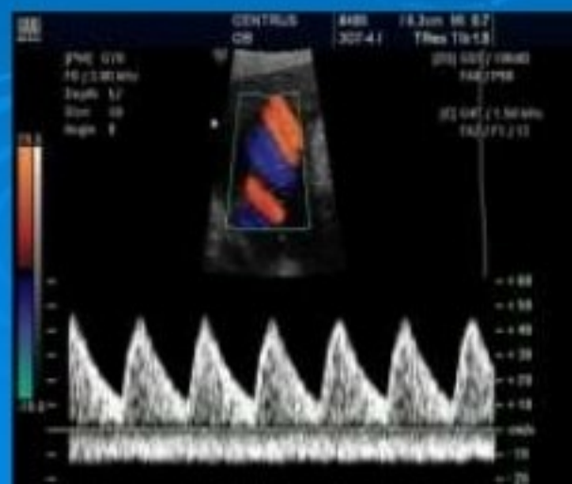




COLOR DOPPLER IN FETAL SURVEILLENCE







PLACENTA

Mat. Heart

▼

Ut. Arteries

▼

Spiral art. Invaded by trophoblast

▼

Uteroplacental circ.

Fetal heart

▼

Umbilical arteries

▼

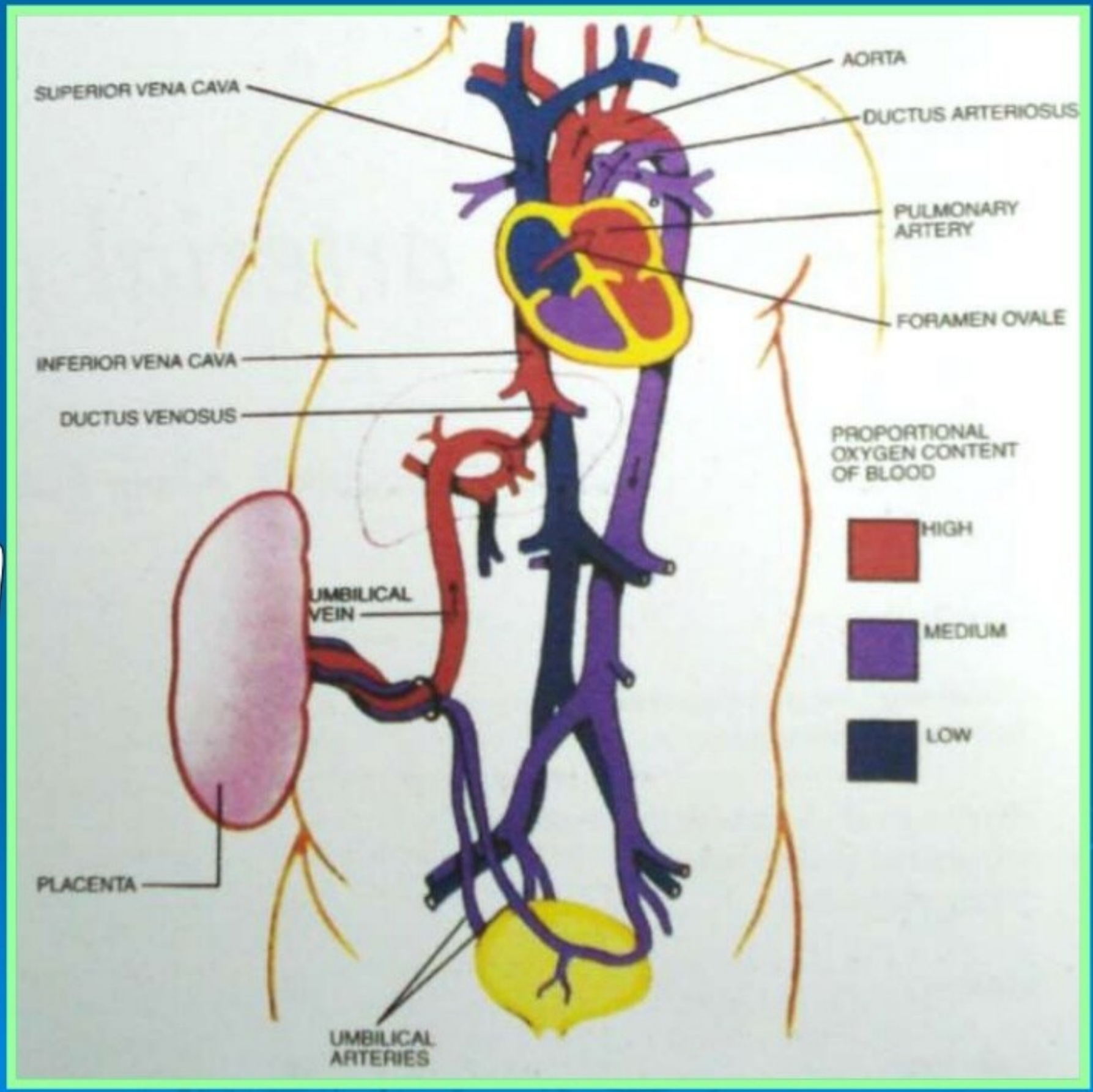
Tertiary villous vessels

▼

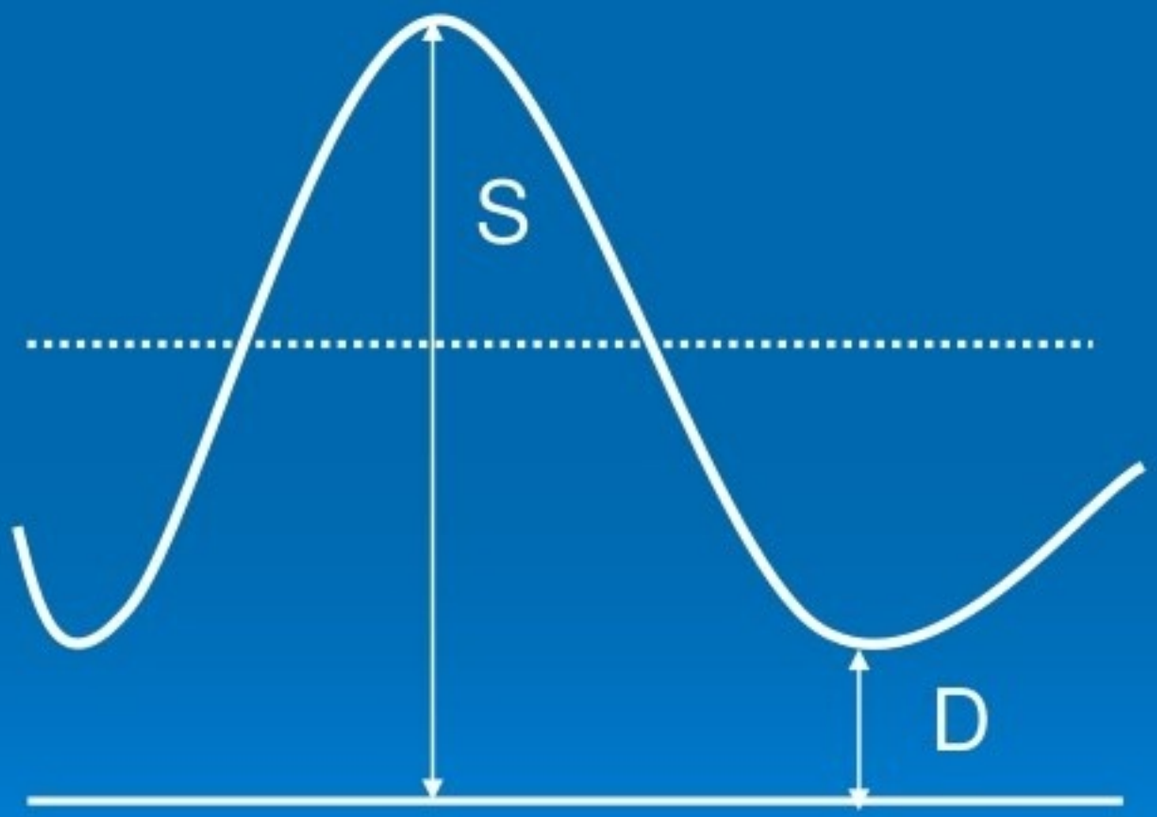
Fetoplacental circ.

LOW PVR

Fetal Circulation



Waveform analysis of blood velocimetry



$$\frac{S}{D} = \textbf{S/D ratio}$$

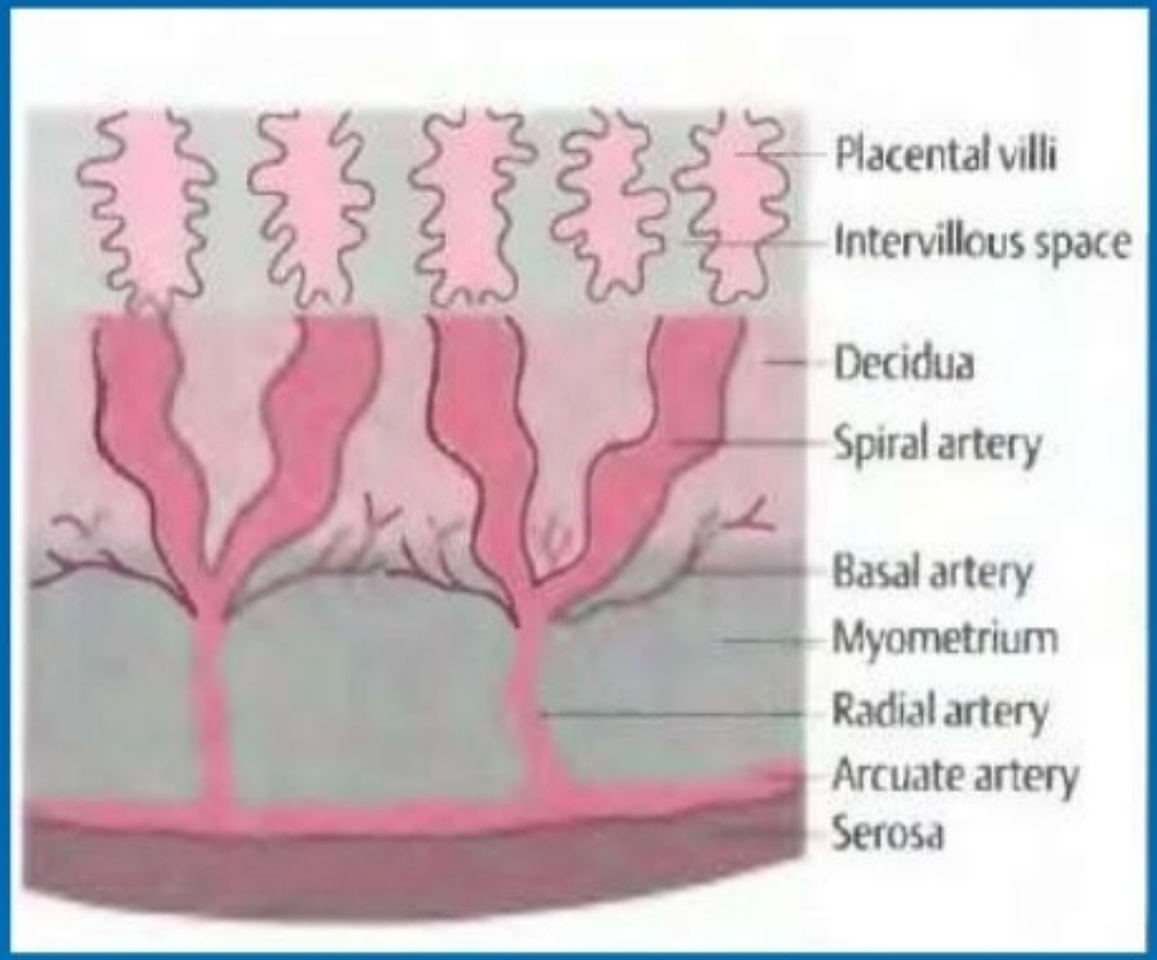
$$\frac{S - D}{S} = \textbf{Resistance index}$$

$$\frac{S - D}{MEAN} = \textbf{Pulsatility index}$$

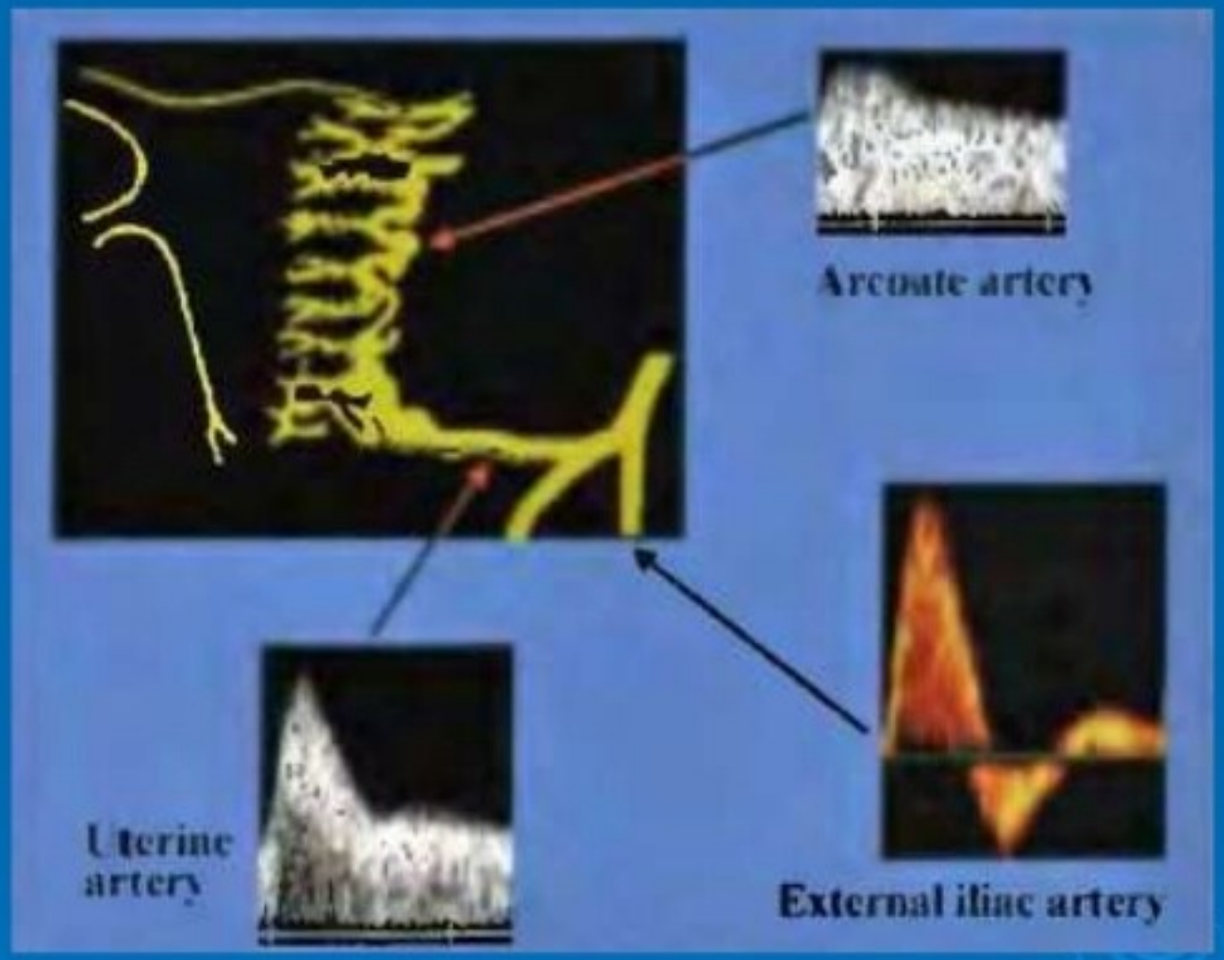
Doppler systolic-diastolic waveform indices of blood flow velocity.
S = Systole ; D = Diastole
Mean is calculated from computer digitized waveform

- These indices are relatively angle independent and are therefore easily applied in clinical practice.
- In practice, none of the indices is superior to the other and any index may be used.
- If end diastolic flow is absent, PI is the only index making evaluation of blood flow possible,because in this situation S/D will equal to infinite and RI to one.
- The PI is more complex because it requires the calculation of the mean velocity, but modern Doppler sonographic devices provide those values in real time.

Uteroplacental circulation



Uteroplacental vascular system with physiologic dilatation of the spiral arteries

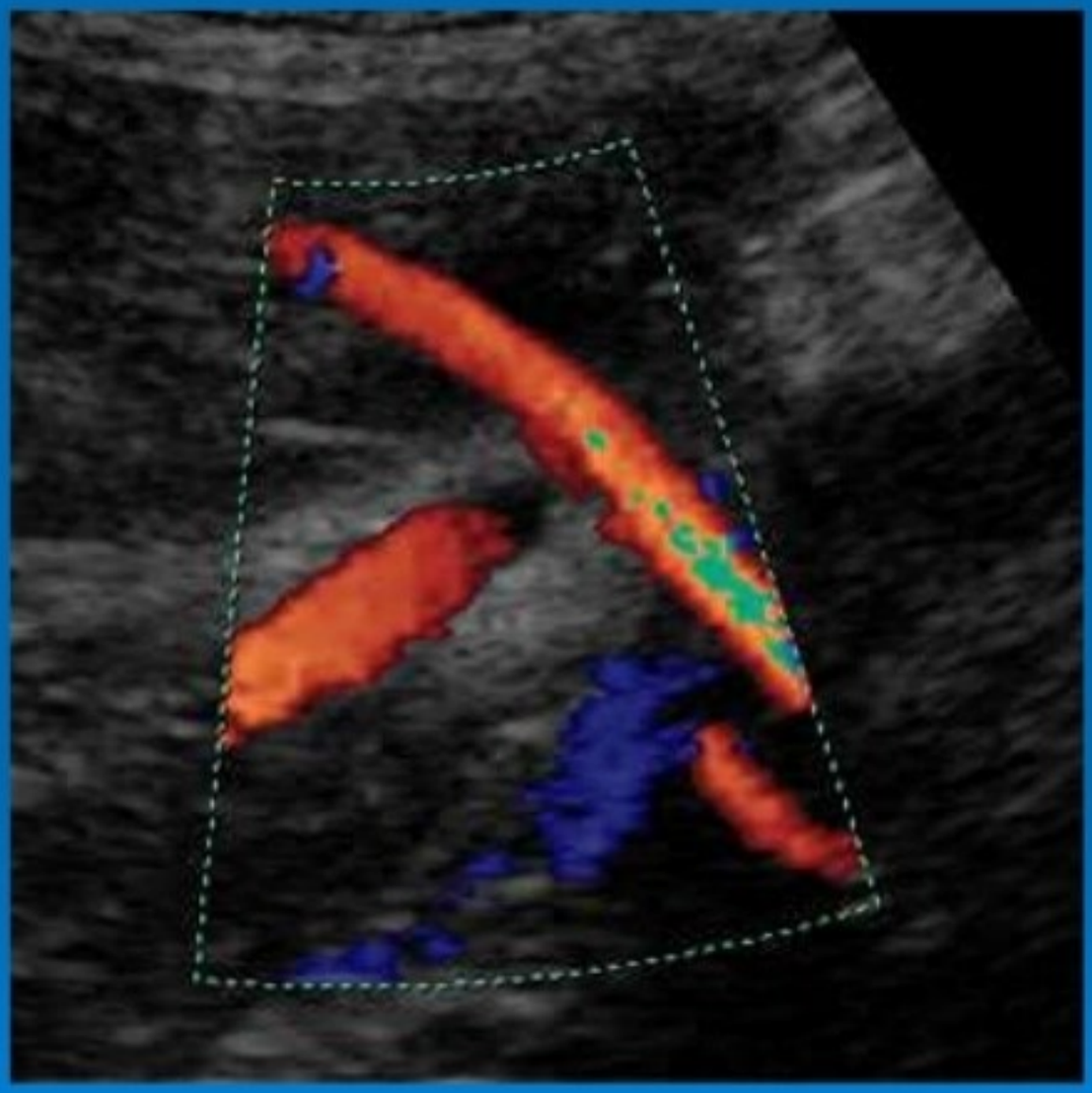


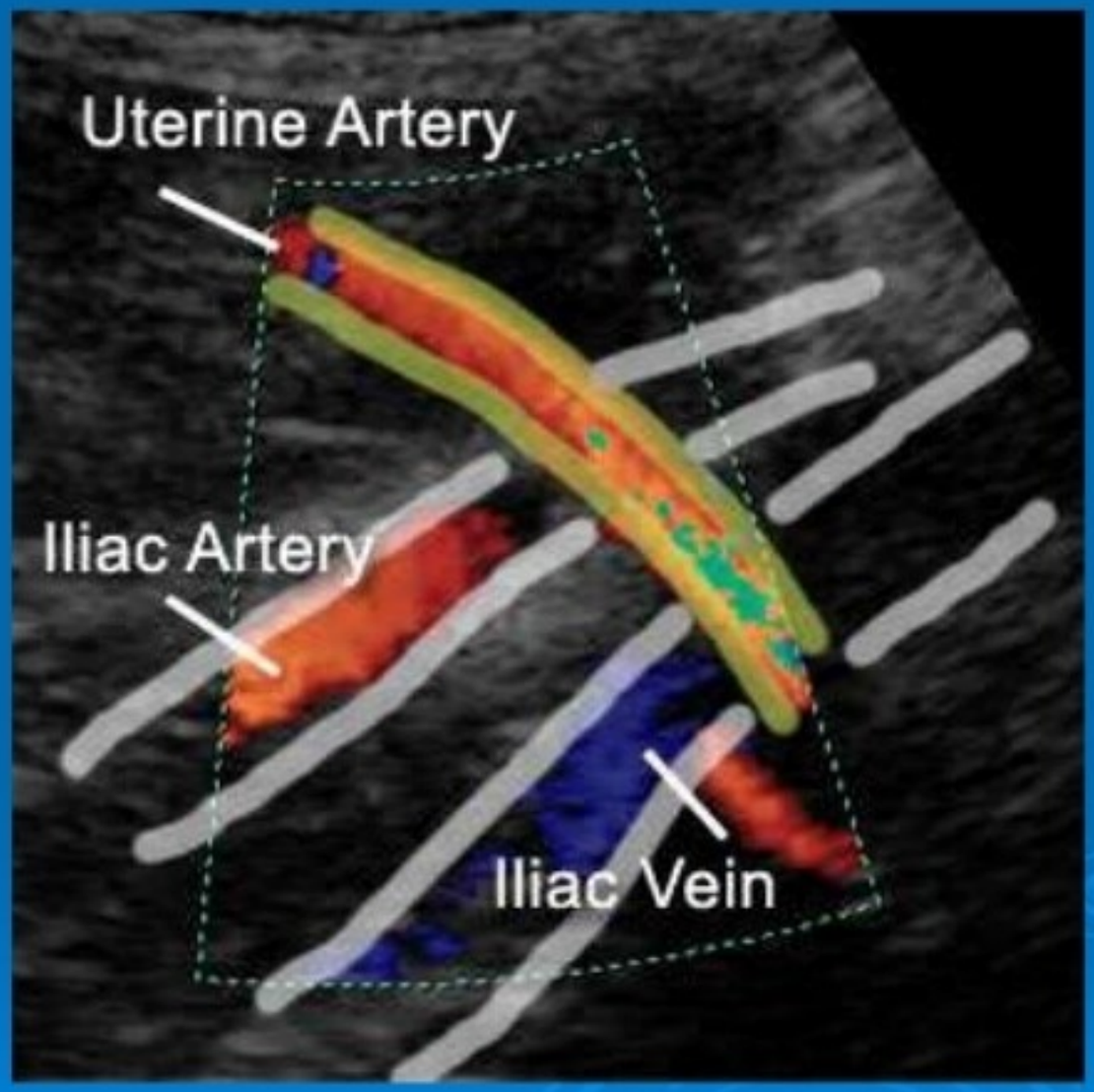
Appearance of Doppler frequency spectra recorded at different sites in the uteroplacental vascular system.

ANATOMY

- Ut. Artery is a branch of the int. iliac a. originating close to the iliac bifurcation
- The ut. arteries cross the ext. iliac a. on either side to reach the uterus at the cervico-isthmic junction. At this point it divides into the ascending & descending branches.
- The ascending branch divides into arcuate, radial, spiral arteries.

ANATOMY





Examination of the uterine arteries

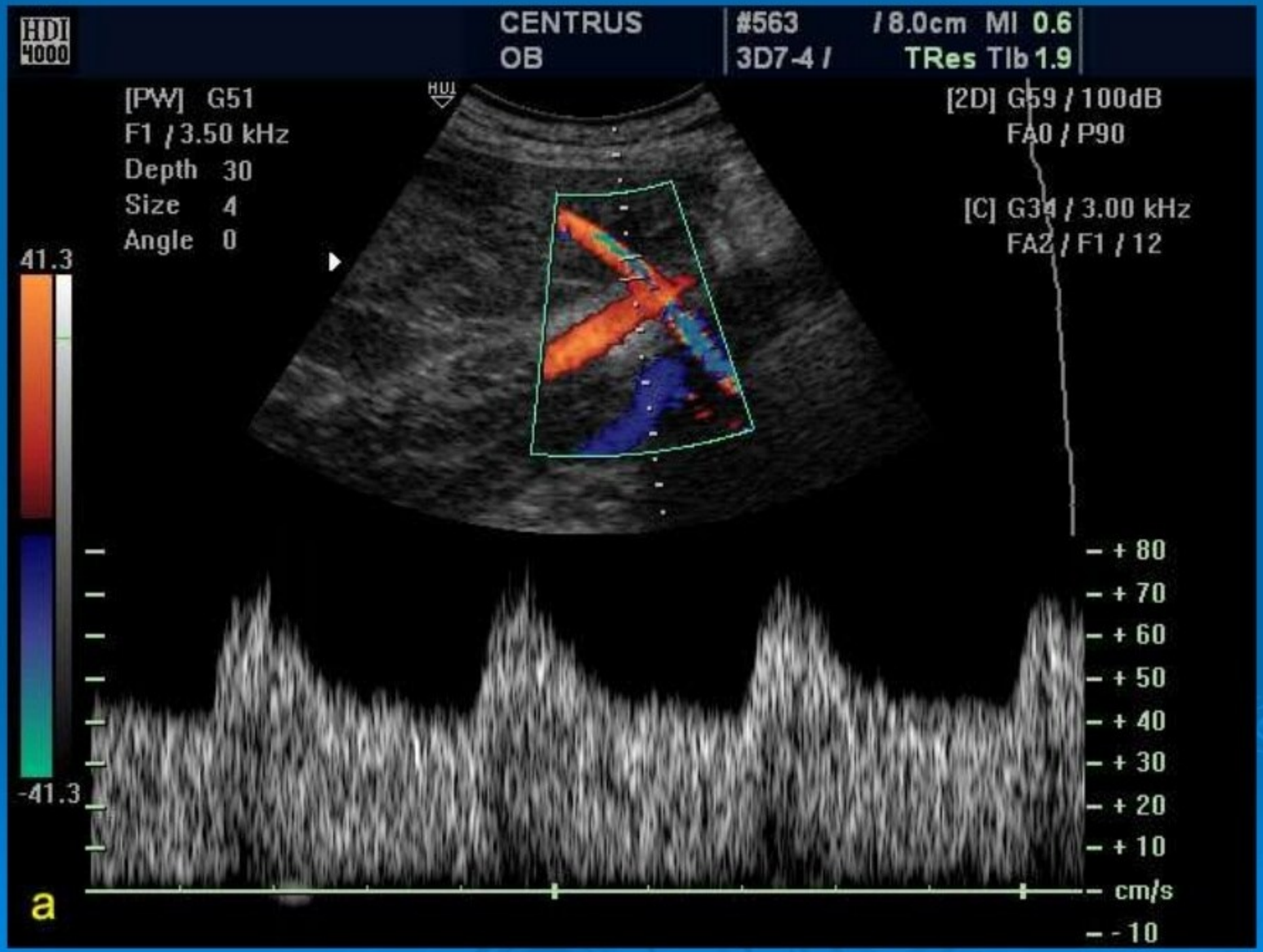
- Signal patterns are recorded from the main trunk of the uterine artery on each side. The artery is located by sweeping the transducer from medially to laterally into the lower outer quadrant of the uterus.

- The uterine artery will appear as a red-encoded vessel coursing toward the uterine fundus.

- The uterine artery and external iliac artery may appear to cross paths, but this phenomenon is seen only during pregnancy and results from increased uterine growth causing a lateral shift of both uterine arteries.

- To record uterine blood flow velocities. the sample volume is placed on the uterine artery approximately 1-2 cm medial to the crossing site, and pulsed Doppler is activated.

- Good-quality uterine artery spectra can be acquired at an insonation angle of 15-50° and should present a sharp, clear envelope curve. The optimum PRF setting for most examinations is between 4 and 6 kHz. using a wall filter setting of 60-120 Hz.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/ 8.0cm MI 0.6
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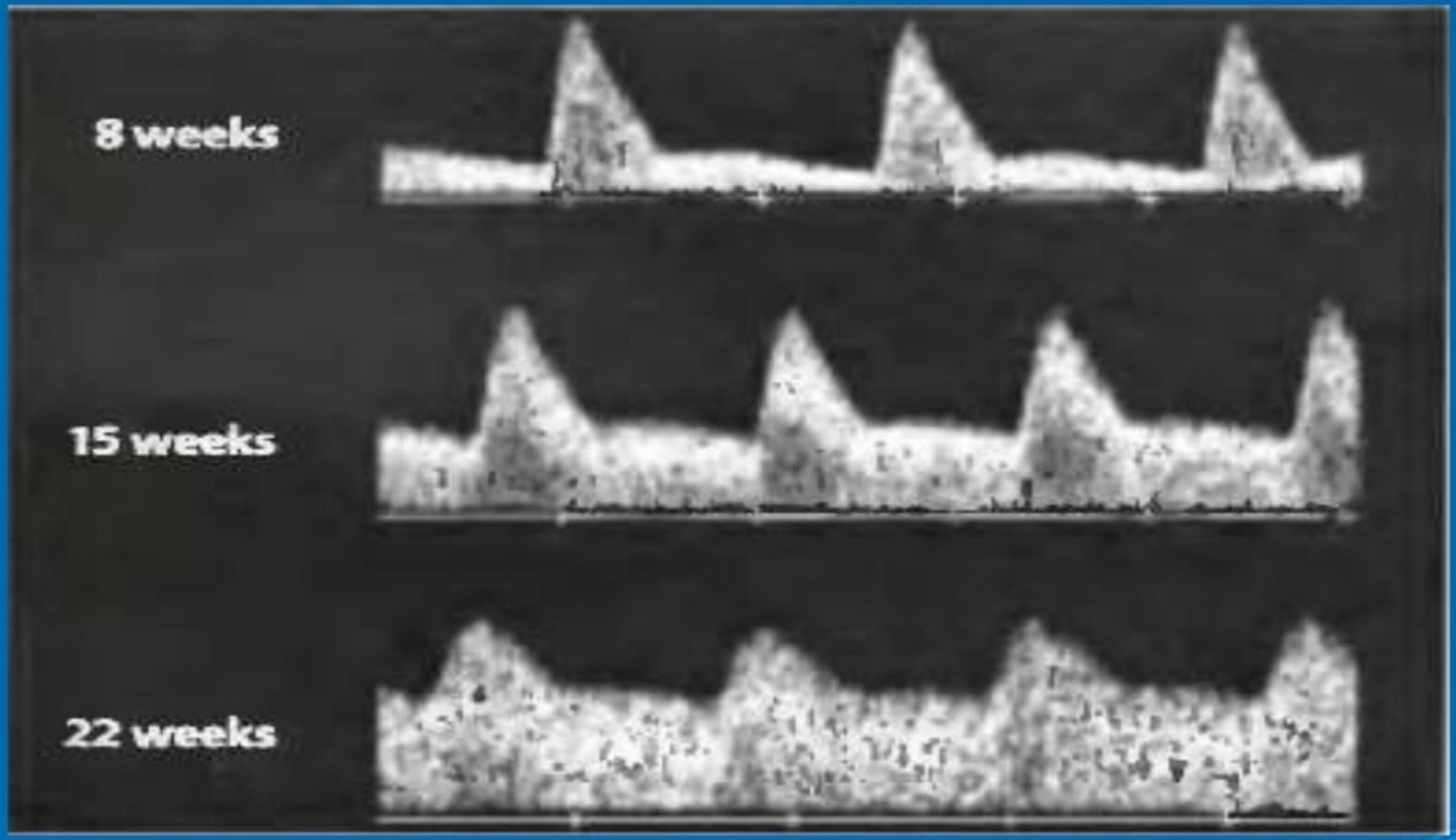
[PW] G51
F1 / 3.50 kHz
Depth 30
Size 4
Angle 0
[2D] G59 / 100dB
FA0 / P90
[C] G34 / 3.00 kHz
FA2 / F1 / 12
41.3
-41.3
+ 80
+ 70
+ 60
+ 50
+ 40
+ 30
+ 20
+ 10
cm/s
- 10
a

NORMAL DOPPLER WAVEFORM CHARACTERISTICS:

- At the start of pregnancy, the uterine signal pattern shows high pulsatility with high systolic and low diastolic flow velocities in addition to an early diastolic (postsystolic) notch.

- This notch represents a pulse wave reflection due to increased peripheral vascular resistance and is the spectral counterpart of incomplete trophoblast invasion.

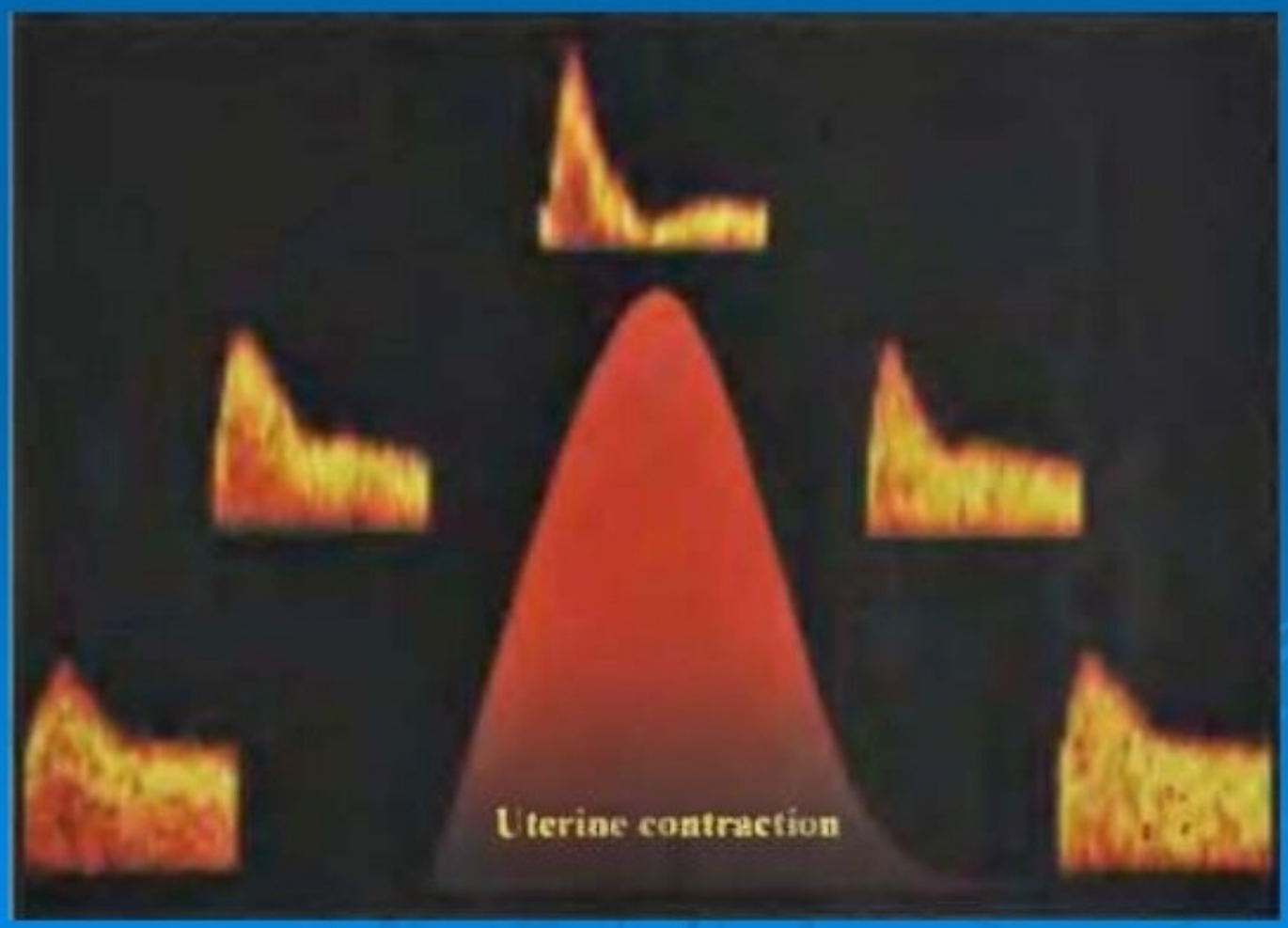
- Under physiologic conditions, the end-diastolic velocities increase with continued gestation while vascular resistance decreases as placentation progresses.
- ***Beyond this period, the diastolic notch gradually disappears & is not seen after 23 wks.***
- Throughout the gestation there is steady increase in the diastolic flow with lowering of the RI



Doppler spectra recorded from the uterine artery at different gestational ages. The progressive increase in diastolic flow velocity is a result of normal trophoblast invasion

Effect of Uterine Contractions on Uterine Artery Waveform

- The end-diastolic velocities in the uterine arteries are reduced when the intrauterine pressure exceeds
- In the interval between contractions, there is a recovery or normalization of uteroplacental blood flow with a corresponding increase in end-diastolic velocities.



Effect of Medications on Uterine Artery Waveform

- Doppler provides a noninvasive method for the evaluation of uteroplacental hemodynamics.
- One area of interest is the effect of vasoactive medications on uterine blood flow.
- The following medications increases EDV and lower resistance indices and hence improve uteroplacental circulation
  - Betamimetics
  - iv magnesium
  - Alpha methyldopa and hydralazine
  - Niphedipine
  - NO donors

Clinical Significance of Uterine Doppler Ultrasound

- Abnormal uterine blood flow velocities do correlate well with
  - ✓ existing or impending foetal growth retardation
  - ✓ preeclampsia, and
  - ✓ increased rates of prematurity, placental abruption , caesarean section, and low birth weight

Indication of uterine artery Doppler

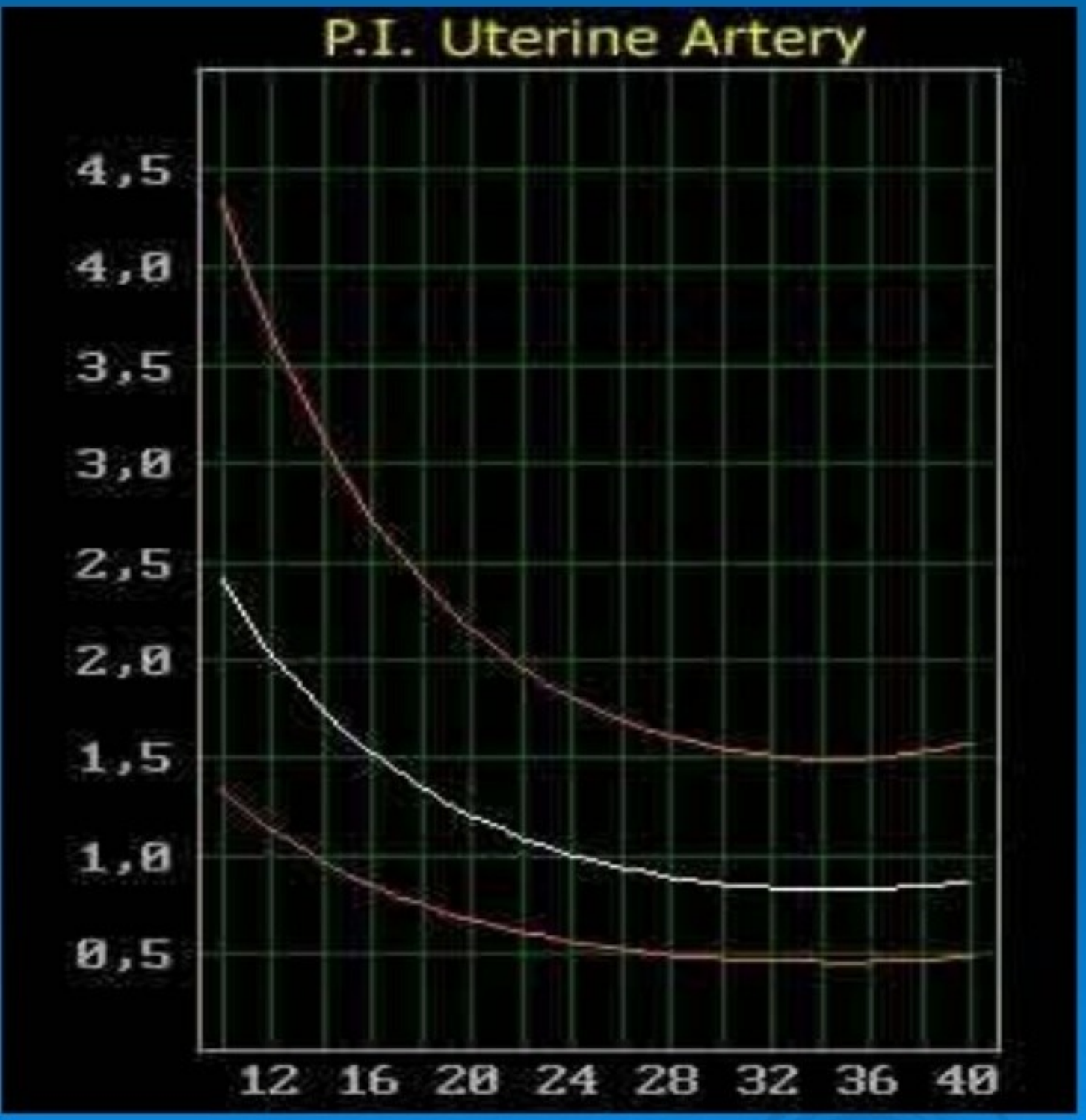
- ✓ Previous or present history of preeclampsia or any other maternal disease like:
  - Maternal collagen vascular disease
  - Maternal hypertension
  - DM with vasculopathy
  - RPL – No work up or APL positive

- ✓ Previous child with IUGR
- ✓ Unexplained high maternal alpha fetoprotein level
- ✓ High HCG levels.

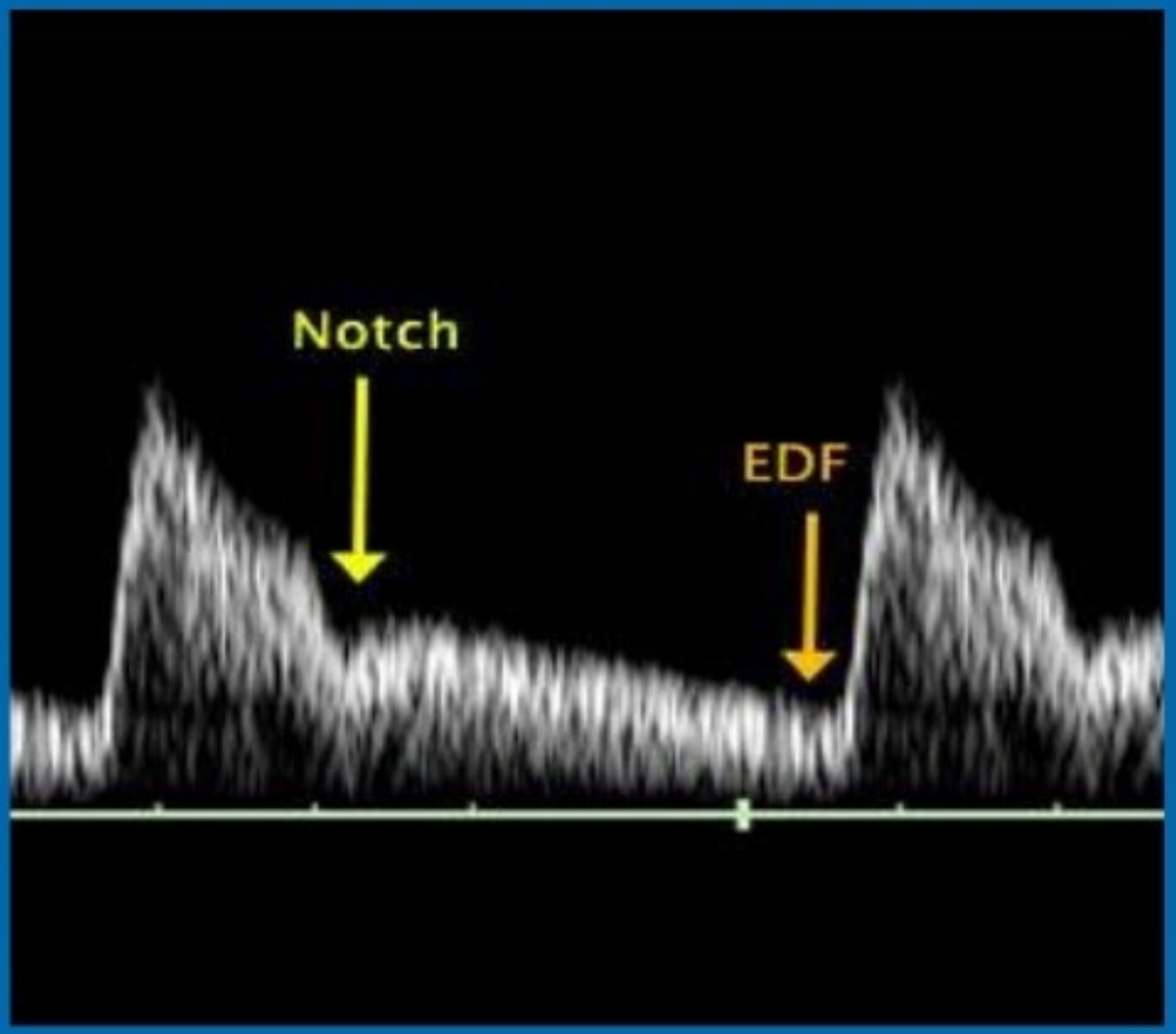
Abnormal Uterine Artery Doppler

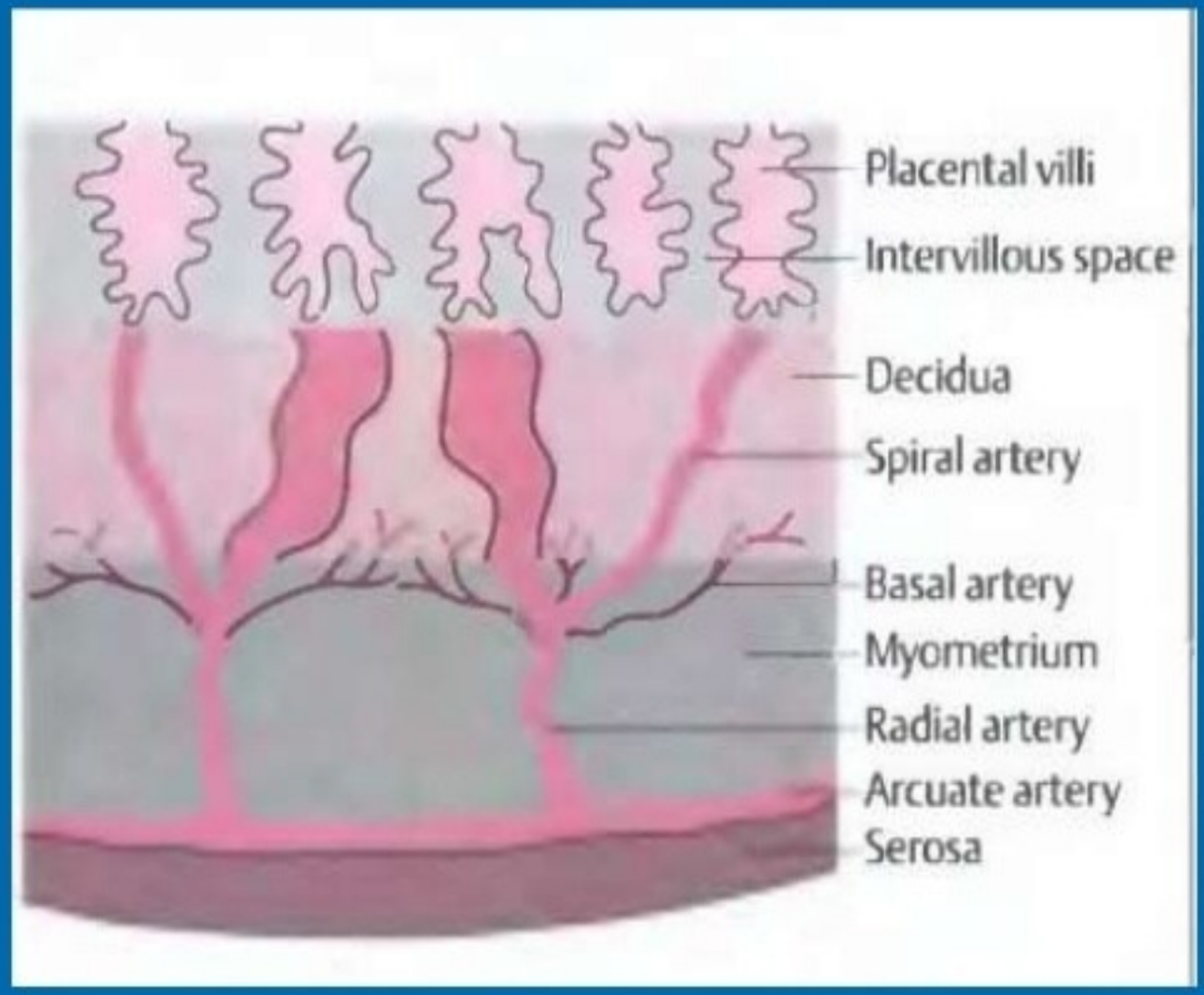
- Persistence of the diastolic notch (bilateral notch or unilateral notch on placental side).
- High vascular resistance (increased indices) i.e. RI > 0.58 after 23 wks ,PI > 1.45.
- RI or PI >95th centile
- Difference between right & left uterine artery S/D ratio > 1.0
- Uterine artery S/D > 2.6 after 22-24 wks scan.
- ***Important is normograph*** of PI of uterine artery. PI should go down as the pregnancy advances.

Normogram



Doppler reference range
for the pulsatility index (PI) of
the uterine
artery for a central placental
location.
The 90% confidence interval is
shown. The upper curve
represents the
approximate 95th percentile.
the middle
curve the 50th percentile. and
the
lower curve the approximate
5th percentile





Abnormal uteroplacental vascular system, with lack of dilatation of the spiral arteries

Doppler Screening of Uterine Vessels

- It is now understood that ut. A. doppler as a screening test in low risk preg. has little or no value. Its value is limited to high risk pregnancies.

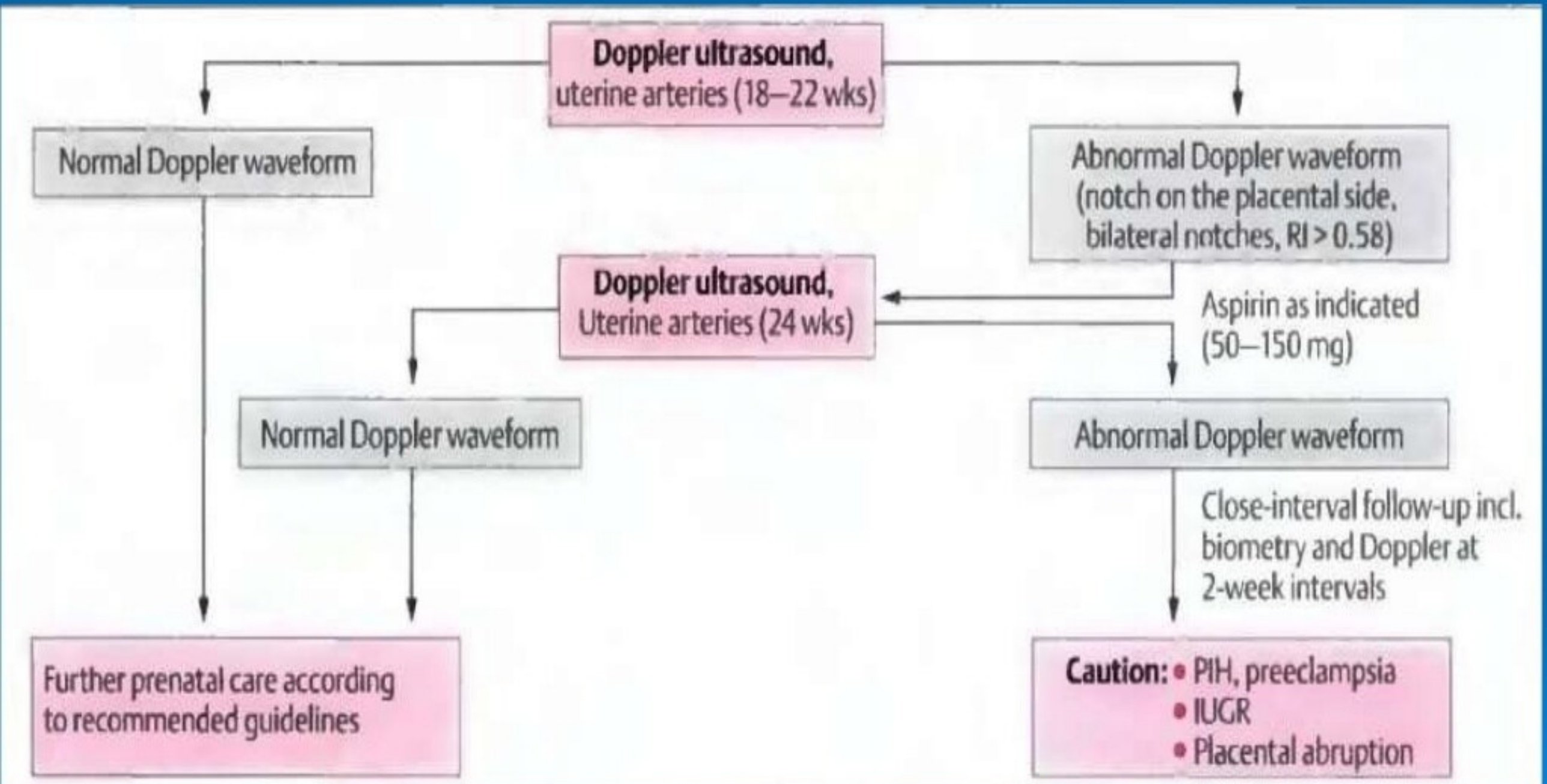
- **A positive uterine artery screening test**

  - ✓ Bilateral early diastolic notch
  - ✓ S/D or PI ≥ 95th percentile
  - ✓ A unilateral notch implies a relatively low risk of pregnancy complications whereas a bilateral notch, especially when combined with high RI values above the 95th percentile. is

- If the PI values of both uterine arteries are normal,the patient can be informed that she most likely will not develop preeclampsia or have an IUGR fetus.

- This is because of the high negative predictive value (>99 %) of the test.

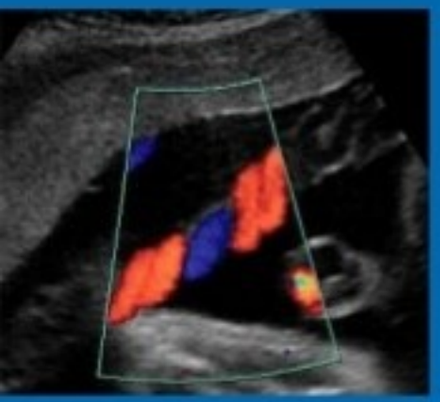
Flowchart for Doppler evaluation of the uterine artery in high-risk patients.



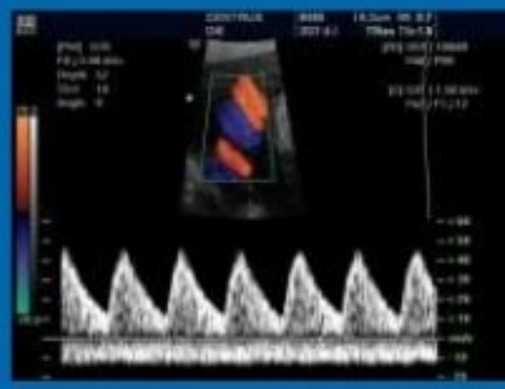
Treatment

- Aim - abnormal uterine artery Doppler in early pregnancy can be effectively treated before onset of pregnancy complications

- Treatment options
  - ✓ Aspirin
  - ✓ Vitamins C/E
  - ✓ Low molecular weight heparin



Doppler study of umbilical arteries



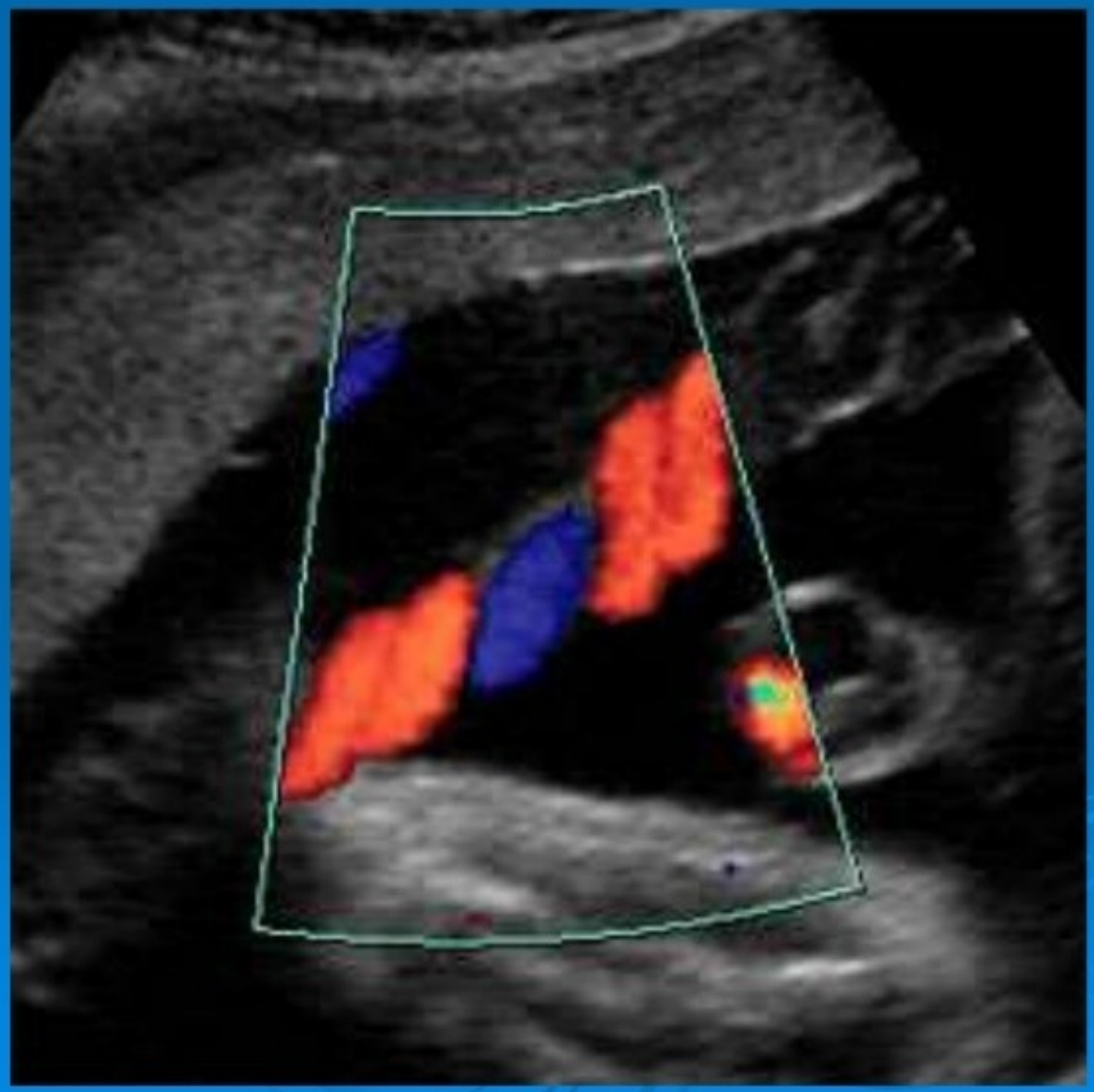
ANATOMY:

- Arise from the int. iliac a. of the fetus & course along the umbilical cord in a long & winding path to reach the placenta
- Intra placentally, they branch into the primary stem villous arteries, which in turn branch into the secondary & tertiary stem villous vessels
- The tertiary stem villi form the vascular bed of the umbilical arteries
- As the preg. advances there is increase in the tertiary stem villi & small muscular arteries leading to decrease in the pl. vascular bed resistance

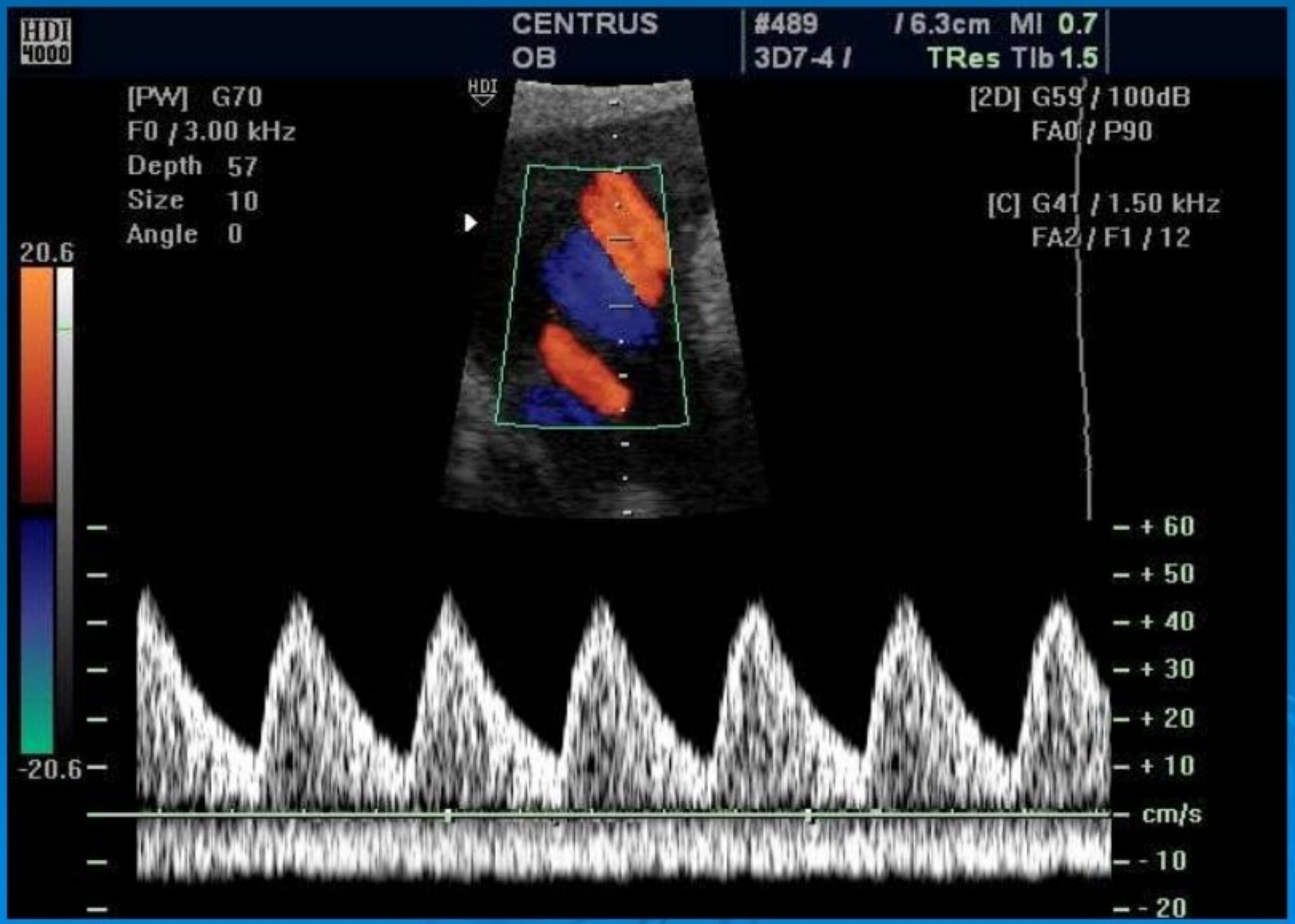
Technique of imaging umbilical artery

- Doppler waveforms of the umbilical arteries can be obtained from any segment along the **free-floating umbilical cord.**
- Waveforms obtained from the placental end of the cord show more end-diastolic flow, thus lower ratio values (RI,S/D) than waveforms obtained from the abdominal cord insertion.The difference is minimal with no clinical significance.
- If there is reversed flow, the umbilical artery is reexamined close to placental insertion as this segment of the artery is the last to develop reversed flow.

Color Doppler image of normal free loop of umbilical cord, demonstrating the two arteries (red) and one vein (blue) at 28 weeks



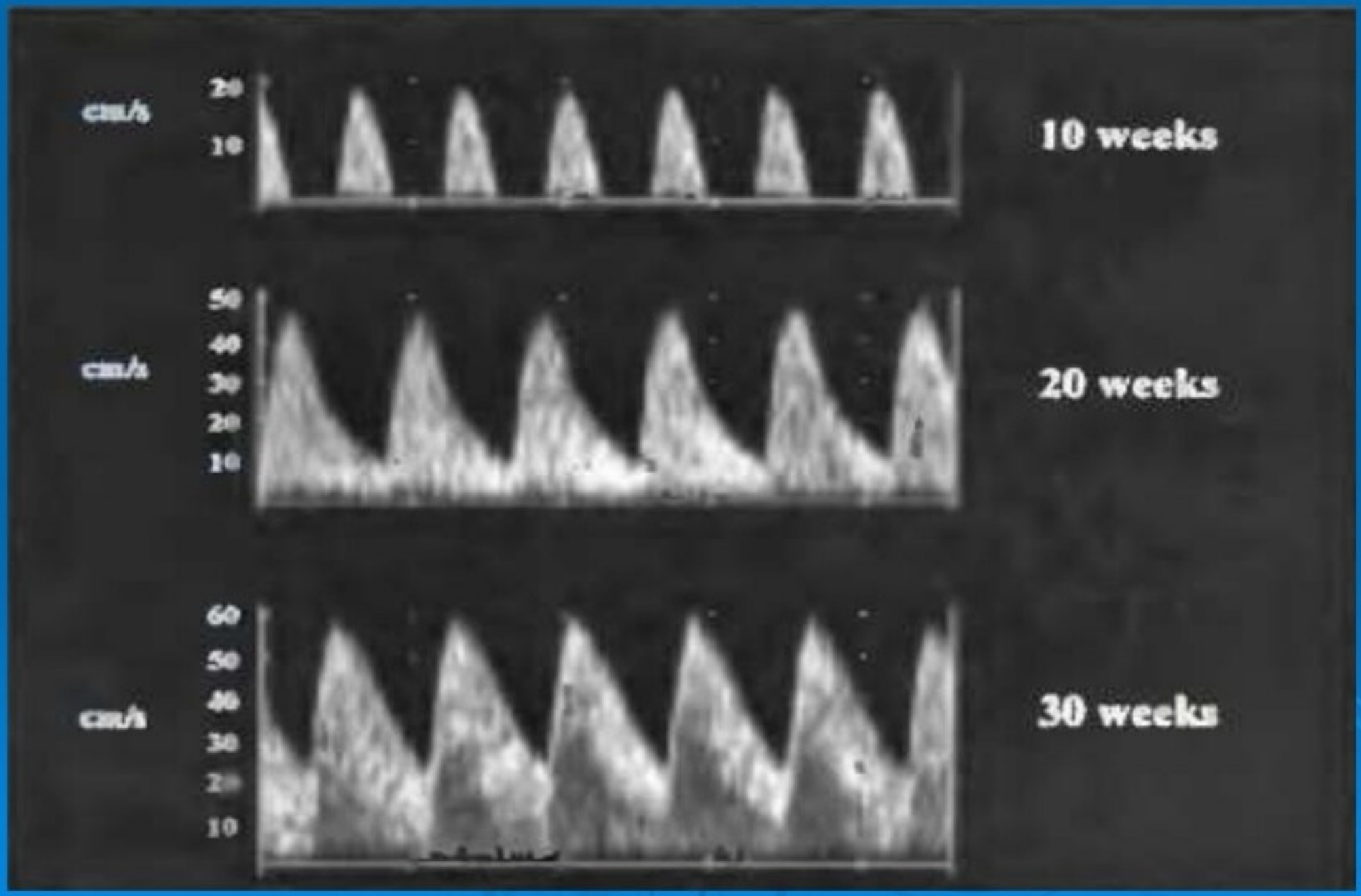
Normal color Doppler frequency spectrum sampled from the umbilical artery



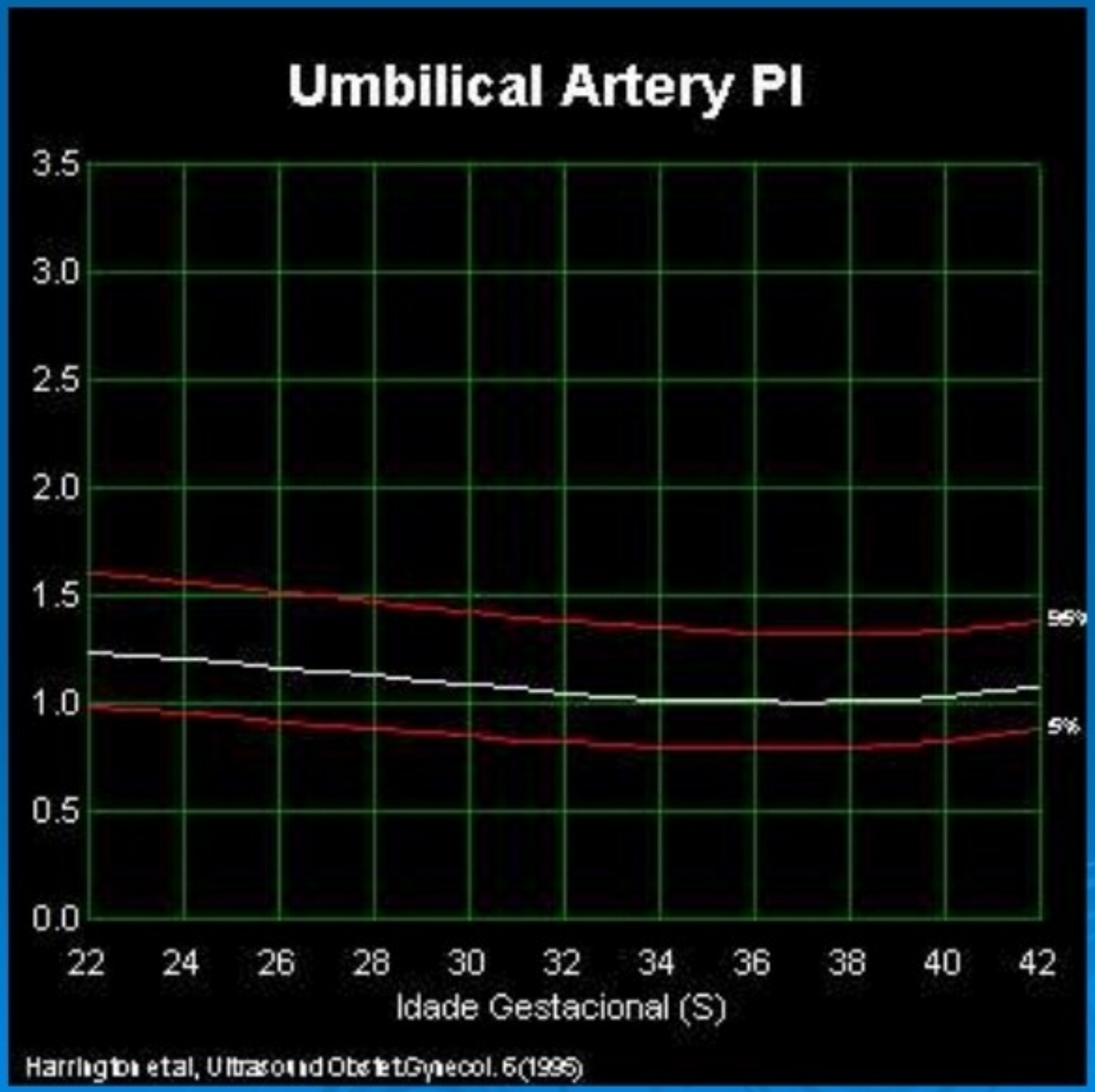
Normal umbilical artery waveforms:

- Early weeks of gestation (till 12 wks)- absent End diastolic blood flow
- Between 12 to14 wks –End diastolic flow develops
- Beyond 14 weeks: end diastolic flow progressively increases.
- As pregnancy advances, there is increase in the diastolic flow & the RI is low
- Umbilical artery sampling is not done in early preg.

Umbilical artery waveform patterns as a function of gestational age. Note the steady, physiologic increase in peak systolic flow velocities and especially in diastolic velocities with advancing gestational age.The absence of diastolic flow at 10 weeks‘ gestation is a normal finding.



Normogram


Umbilical Artery PI
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
95%
5%
22
24
26
28
30
32
34
36
38
40
42
Idade Gestacional (S)
Harrington et al, Ultrasound Obstet Gynecol. 6(1995)

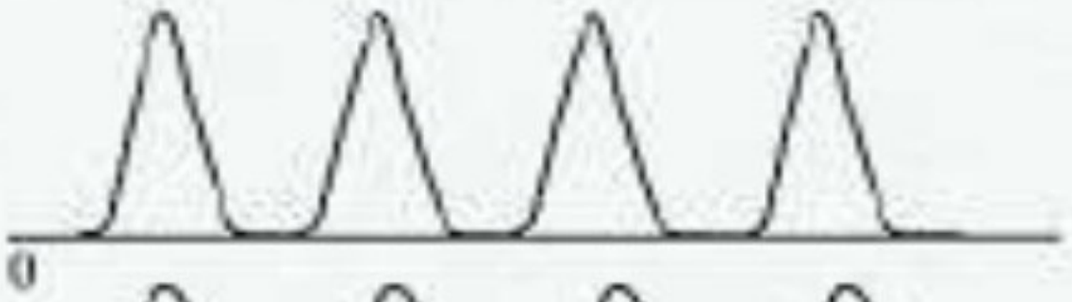
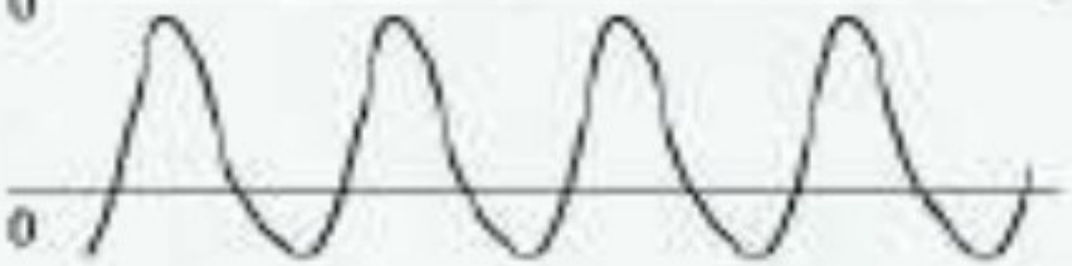
Abnormal umbilical a. waveform:

- Occlusion of the tertiary villous arteries due to thrombosis, fibrinoid necrosis or edema
- Decreased no. of small muscular arteries lead to asymmetric IUGR
- Why umbilical a. doppler can't be used as a "screening test" for IUGR? Upto 70% of the placental tertiary villi should be affected to show changes in umbilical a. waveform, while even when 40% of the villi are affected, IUGR will be present.

Abnormal waveforms:

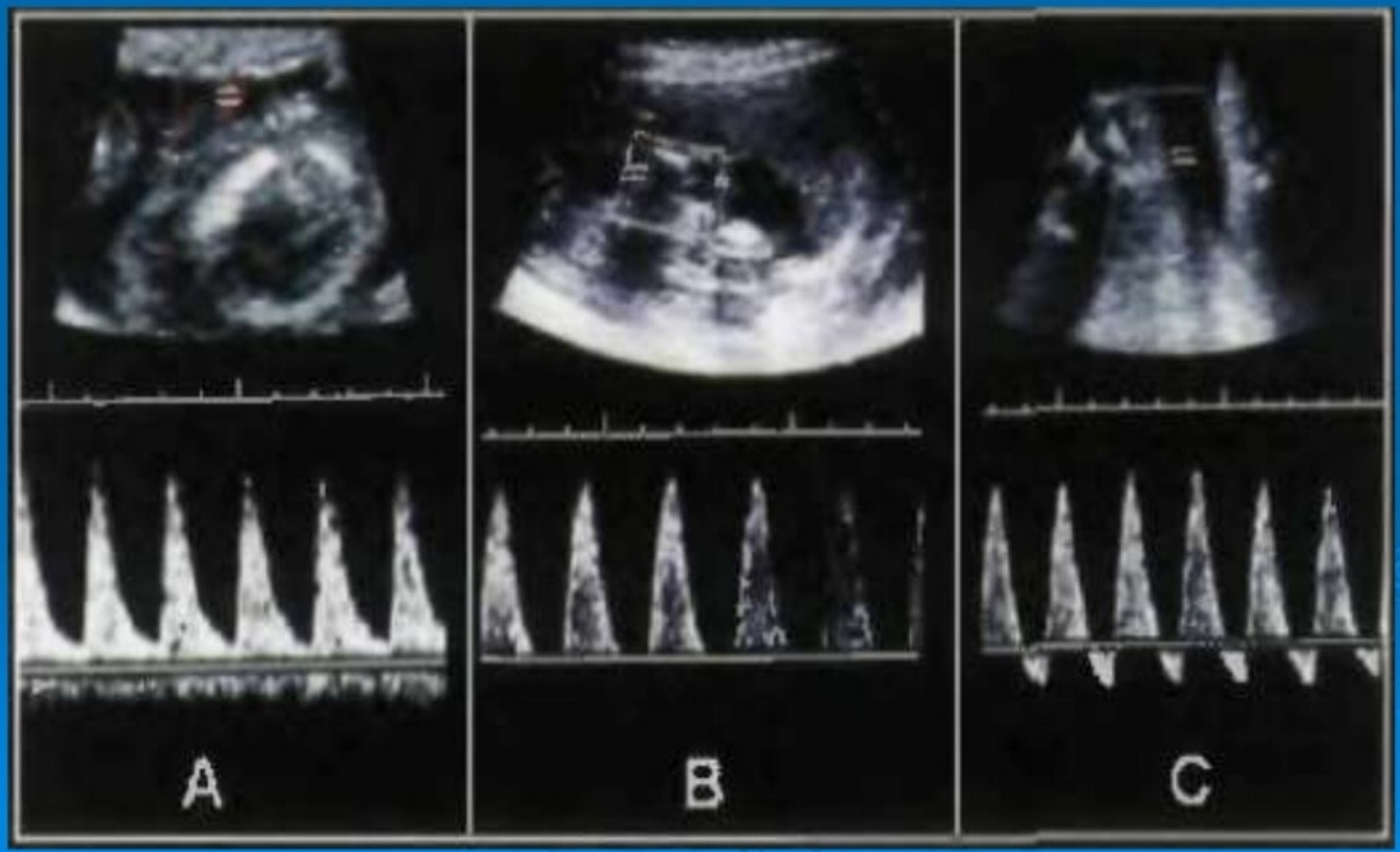
- Low diastolic flow [High resistance] i.e resistance indices above the 95th percentile
- AEDF
- REDF

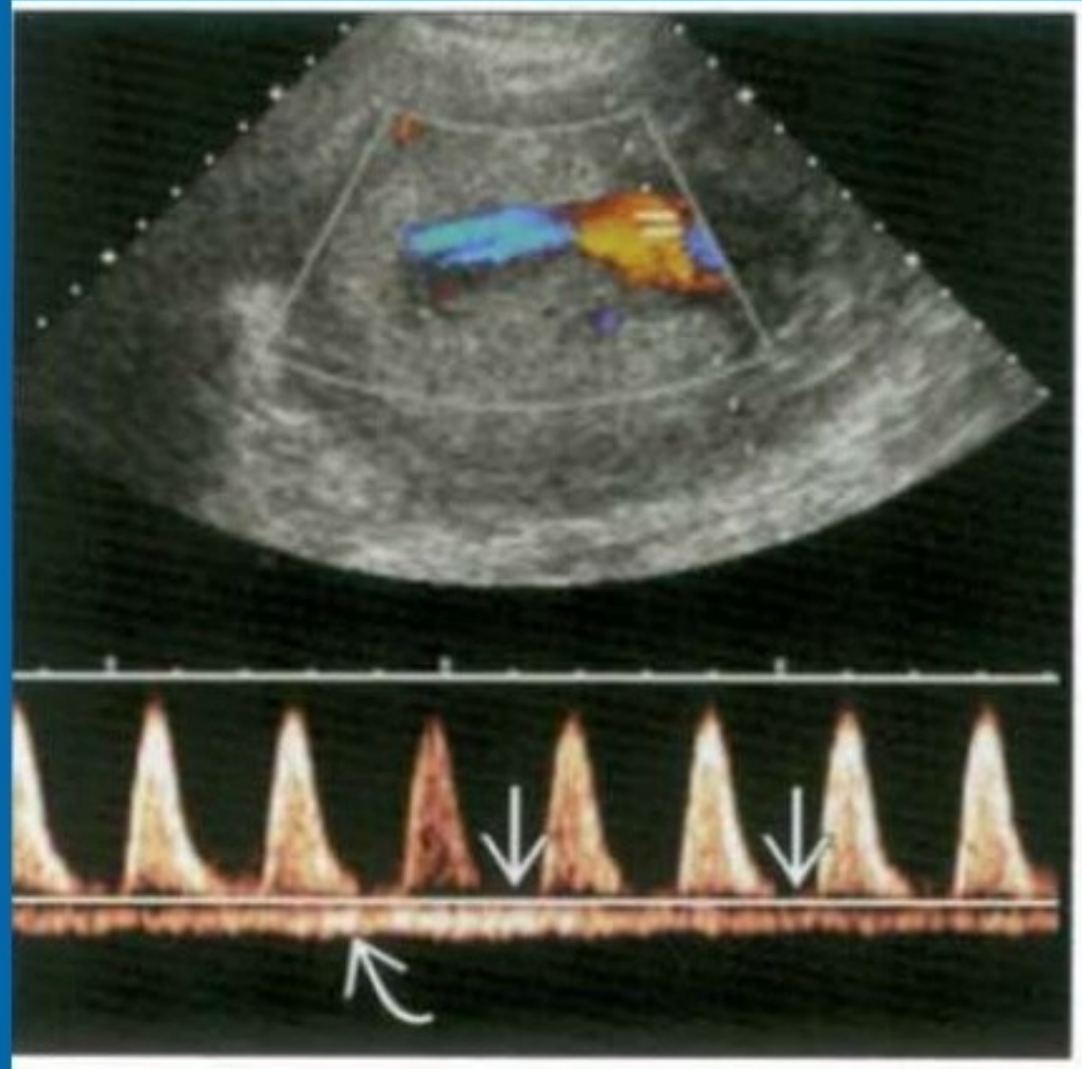
Above 3 types are an indication of increasing resistance which correlates with FETAL HYPOXIA.

Class 0	PI < + 2 SD and continuous forward diastolic flow
Class I	PI ≥ + 2 SD and continuous forward flow
Class II	
Class IIIa	
Class IIIb	

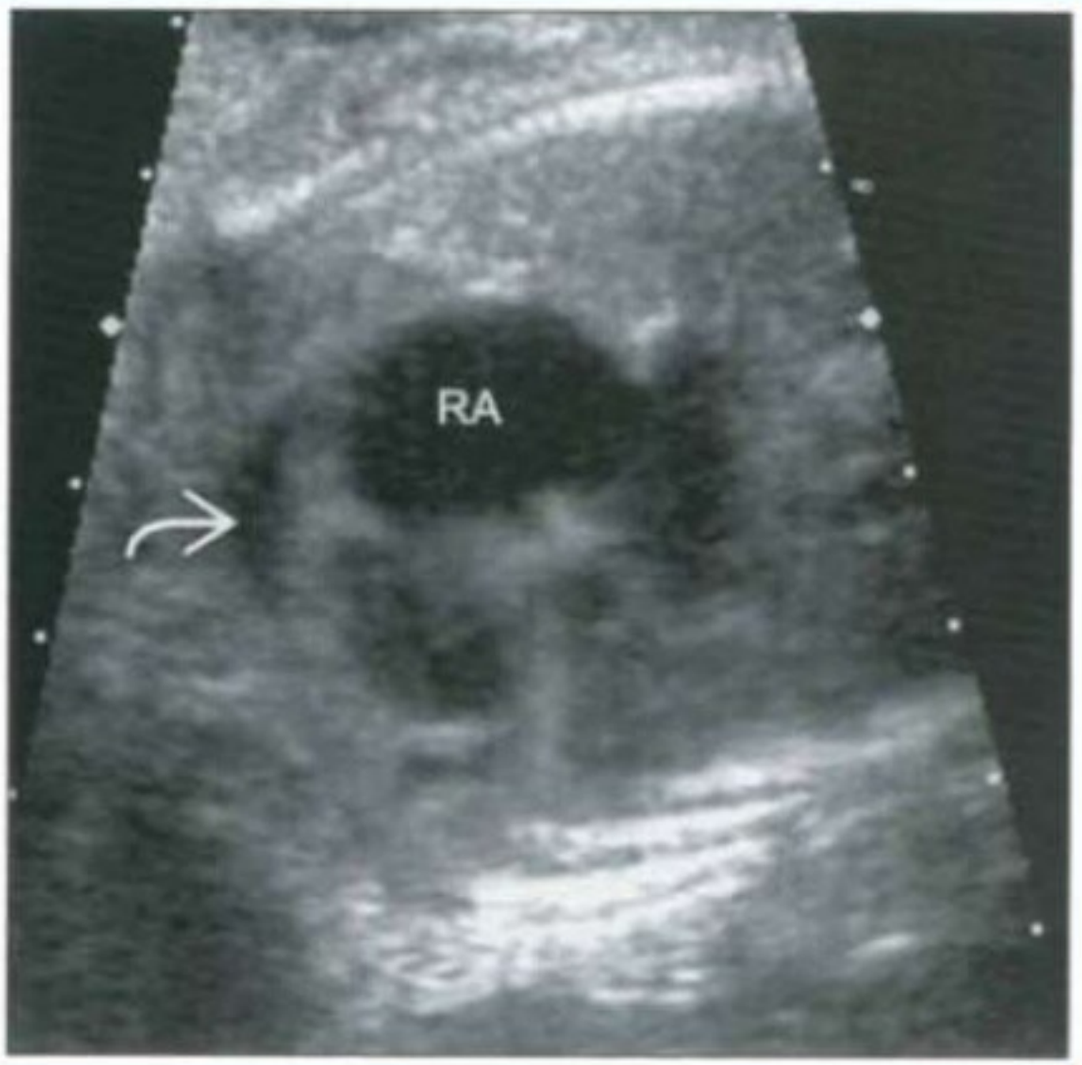
Class IIIa and IIIb is associated with 45% increase in perinatal mortality

Abnormal umbilical artery waveforms; decreased end-diastolic velocity *(A)*, absent end-diastolic velocity *(B)*, reversed end-diastolic velocity *(C)*.

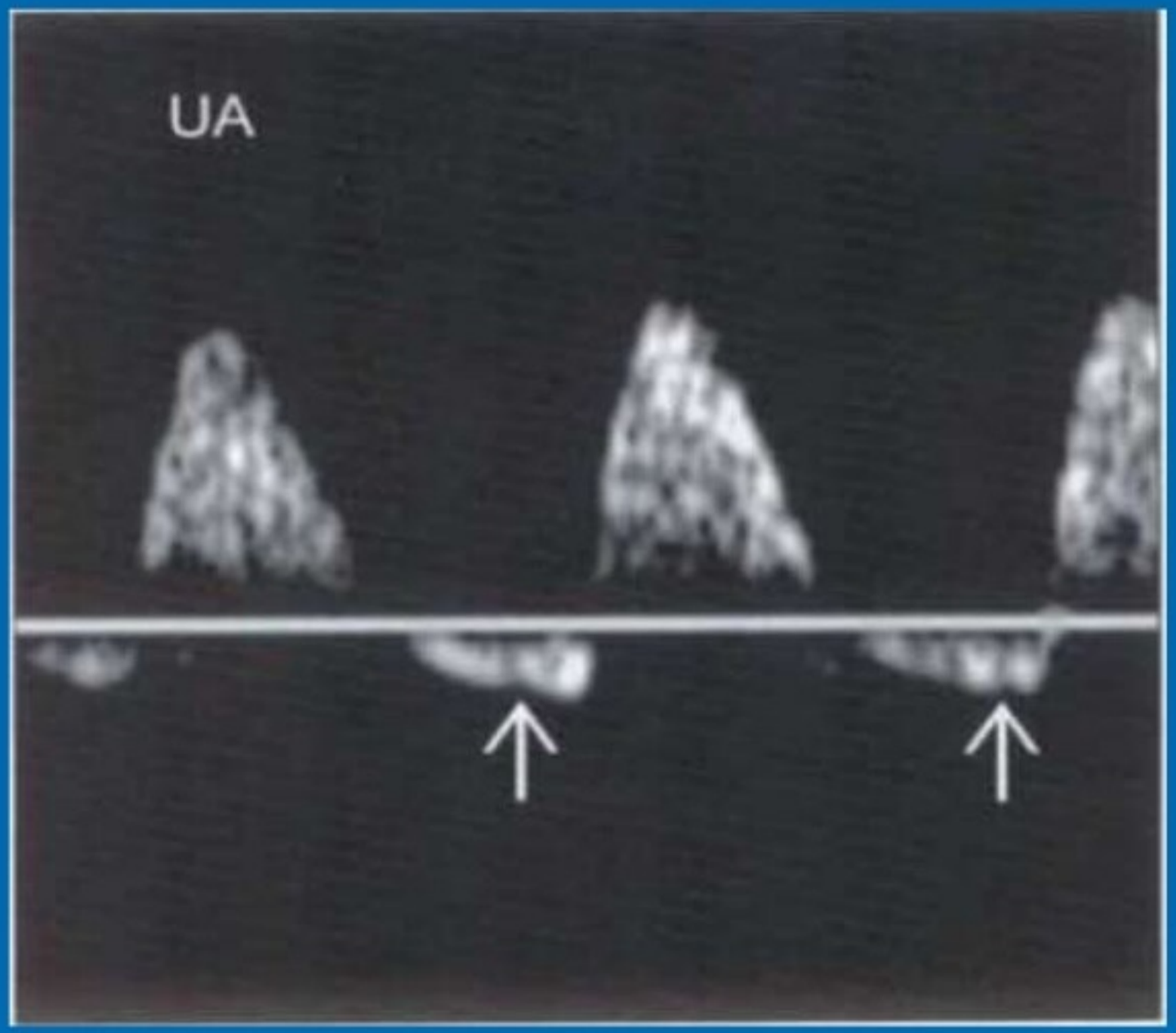




Pulsed Doppler ultrasound shows absent end-diastolic flow in the umbilical artery (arrows). This implies increased placental vascular resistance. The umbilical vein flow (curved arrow) is normal.



Axial ultrasound in the same fetus shows cardiomegaly right atrial (RA) enlargement, pericardial effusion (arrow) and oligohydramnios. UV flow remained normal despite clear cardiac compromise.



Pulsed Doppler ultrasound shows reversed end-diastolic flow (arrows) in the umbilical artery (UA).This implies that placental resistance is so high that blood flows away from the placenta back into the umbilical arteries during diastole.

Abnormal Umbilical Artery Doppler

- Umbilical artery RI ≥0.8 is always abnormal at any gestational age.

- PI valves range from 2.0 to 1.5 in second trimester and 1.5 to 1.0 in third trimester.Values above this is abnormal.

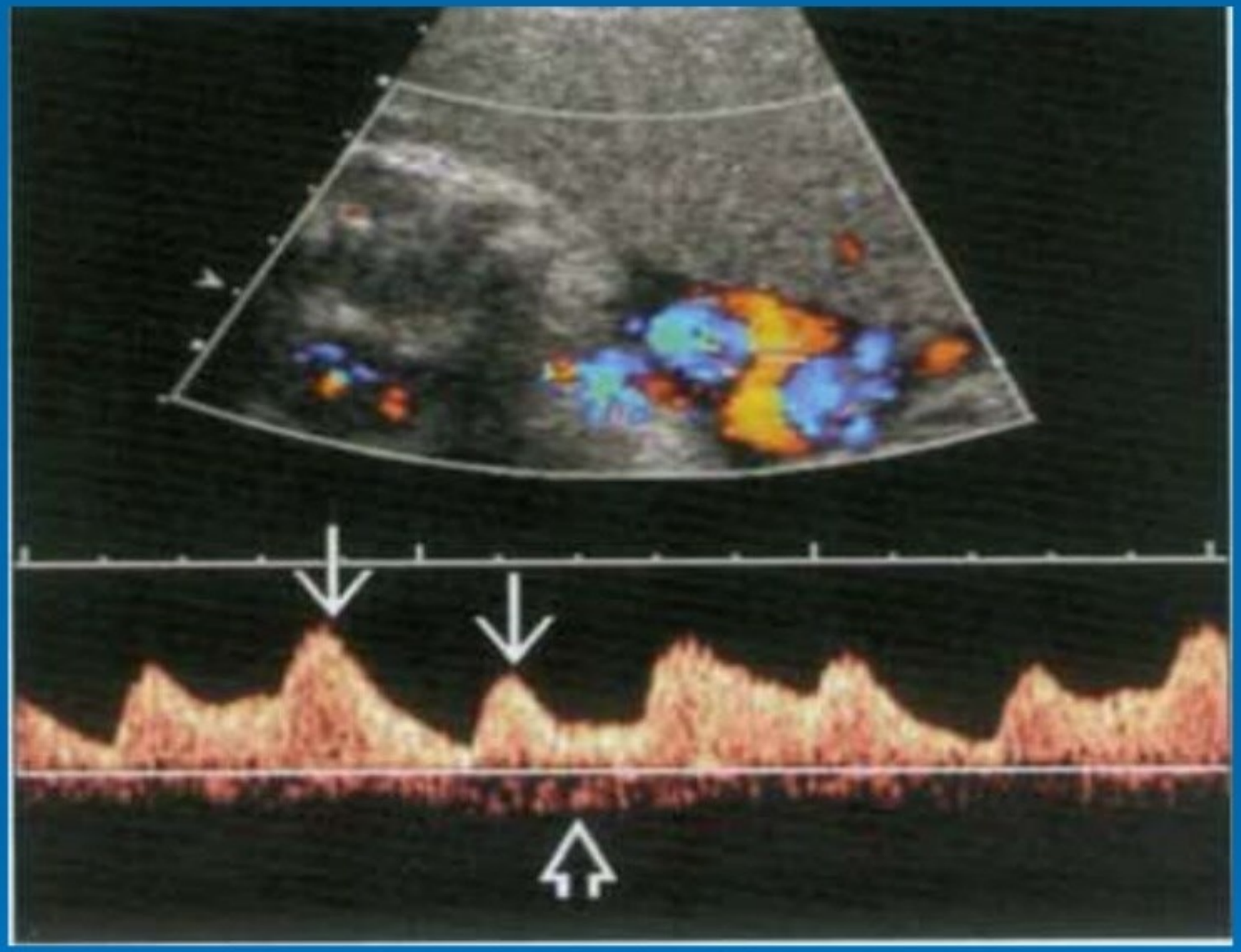
- S/D ratio > 3 in umbilical a. beyond 30 weeks is abnormal. Doppler WF becomes abnormal 2 weeks earlier than abnormal CTG

Pitfalls:

- Fetal movements & Fetal breathing movements will induce high beat to beat variability.
- Common sources of error are too-low insonation angle, wall filter setting > 120 Hz, poorly defined Doppler waveform, or a heart rate outside normal limits
- Transient AEDF may be due to cord compression or due to myo-metrial contraction
- Changing patient's position or examination after sometime can show a normal doppler waveform

Artefactual loss of end-diastolic frequencies

- A high angle between the ultrasound beam and the vessel results in very low frequencies disappearing below the height of the vessel wall filter
- If end-diastolic frequencies appear absent you should reduce the vessel wall filter to its lowest setting, or remove it if possible. Then you should alter the angle of the probe relative to the maternal abdomen to reduce the angle of insonation. If end diastolic frequencies are still absent you should then attempt to obtain the signal from a different site, because this is likely to result in a different angle of insonation. Do not report the absence of end-diastolic frequencies until this has been demonstrated on two successive days.



Pulsed Doppler ultrasound shows dramatic variations (arrows) in UA peak systolic velocity during fetal breathing. Umbilical vein flow (open arrow) is also phasic. The tracing was normal after breathing stopped.

- It is important to note that normal umbilical artery waveforms after 34 weeks' gestation do not exclude fetal hypoxemia and acidemia.
- Loss of end-diastolic frequencies occurs only when over 70% of the placental vascular bed has been obliterated. The latter is less likely to occur after 34 weeks' gestation, hence the limitation of umbilical artery Doppler at later gestations

Treatment

- > 32-34 weeks

  Abnormal Doppler contributes to decision to deliver
- In second trimester

  Weigh risks of hostile intrauterine environment vs. risks of extreme prematurity
- AEDF

  Bed rest, aggressive management of maternal disease

  30% improve within 48 hrs

  Improvement supports continuation of pregnancy in second trimester

  Perinatal mortality AEDF:9%

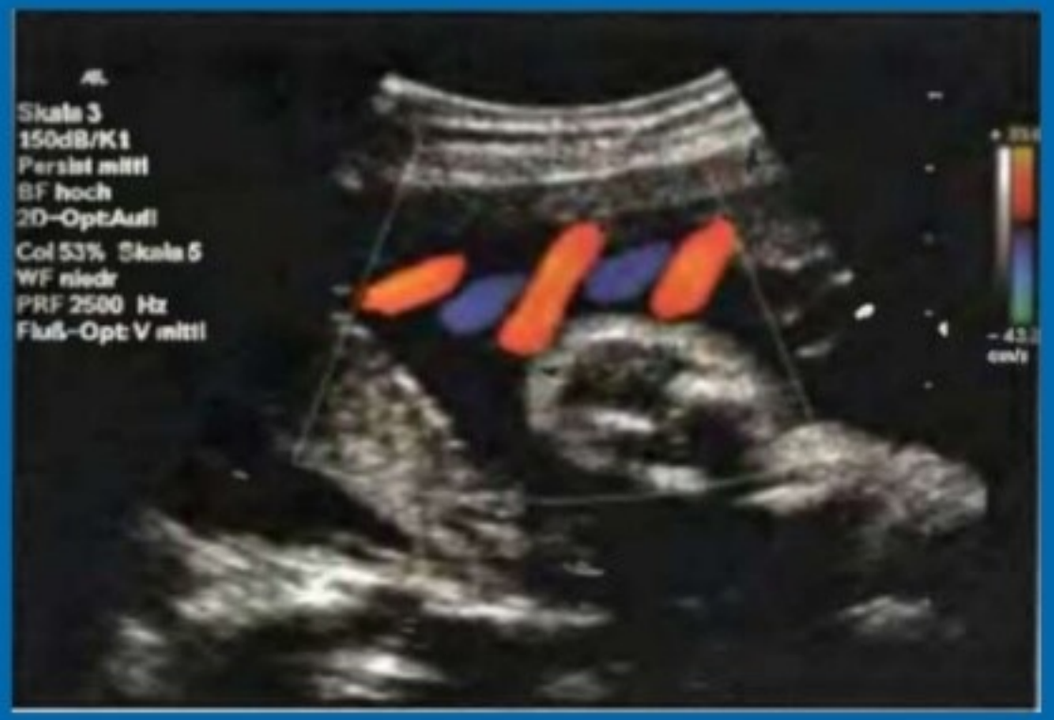
- **REDF**

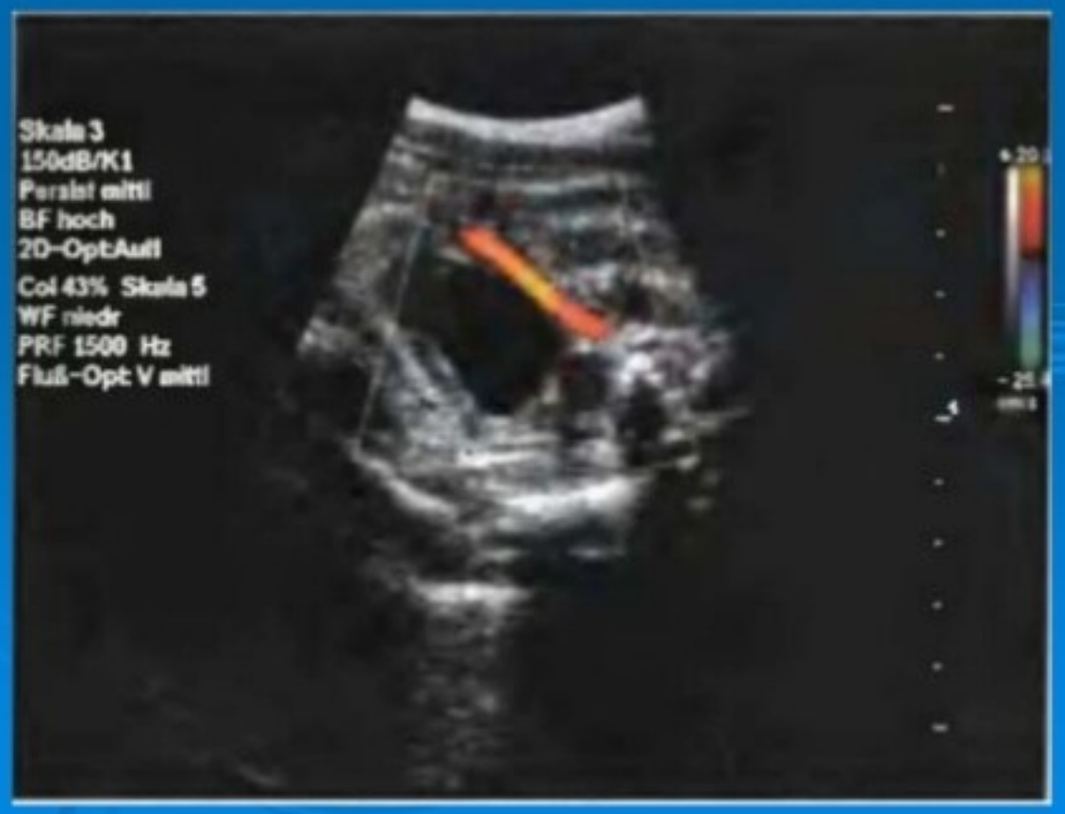
Quantified by ratio of highest amplitude forward flow (A)/maximum reverse flow (B)

- ✓ A/B ratio> 4.3 without venous pulsation in free loop may support expectant management in second trimester
- ✓ Perinatal mortality REDF:36%
- ✓ REDF is associated with fetal demise within 1-7 days
- Addition of venous Doppler ~ more information on fetal response to adverse conditions

Single Umbilical Artery

- Absence of the left umbilical artery (73%) is more common than the right (27%).
- Due to the markedly increased rate of congenital anomalies, chromosomal abnormalities. intrauterine growth retardation,prematurity, and increased perinatal mortality, the affected fetuses are considered high-risk and should undergo a detailed ultrasound evaluation





- Color imaging of the fetal pelvic vessels can also be a useful adjunct.
- In Doppler studies of the common iliac arteries and femoral arteries, significantly higher pulsatility indices have been found on the side of the absent umbilical artery i.e., the side that does not contribute to the fetoplacental circulation.
- Single umbilical artery is associated with:

- Usually normal with isolated SUA
- 50% aneuploidy rate if SUA + other anomalies
- Trisomy 18
- Trisomy 13
- Sirenomyelia
- Renal agenesis

Middle cerebral artery

- The circle of willis is formed by the anastomosis of the MCA, ACA & PCA faciliteted by their respective communicating arteries.

- Why MCA is chosen for sampling?

  MCA has a conducive course & highly reproducible,easy to identify and can be studied easily with an angle of 0 degrees between the ultrasound beam and the direction of blood flow,providing information on the true velocity of blood flow.

- Unlike the uterine & umbilical artery vascular beds which constantly change with advancing gestational age, the MCA vascular bed resistance is almost constant throughout pregnancy.
RI= 0.75-0.85

Imaging technique

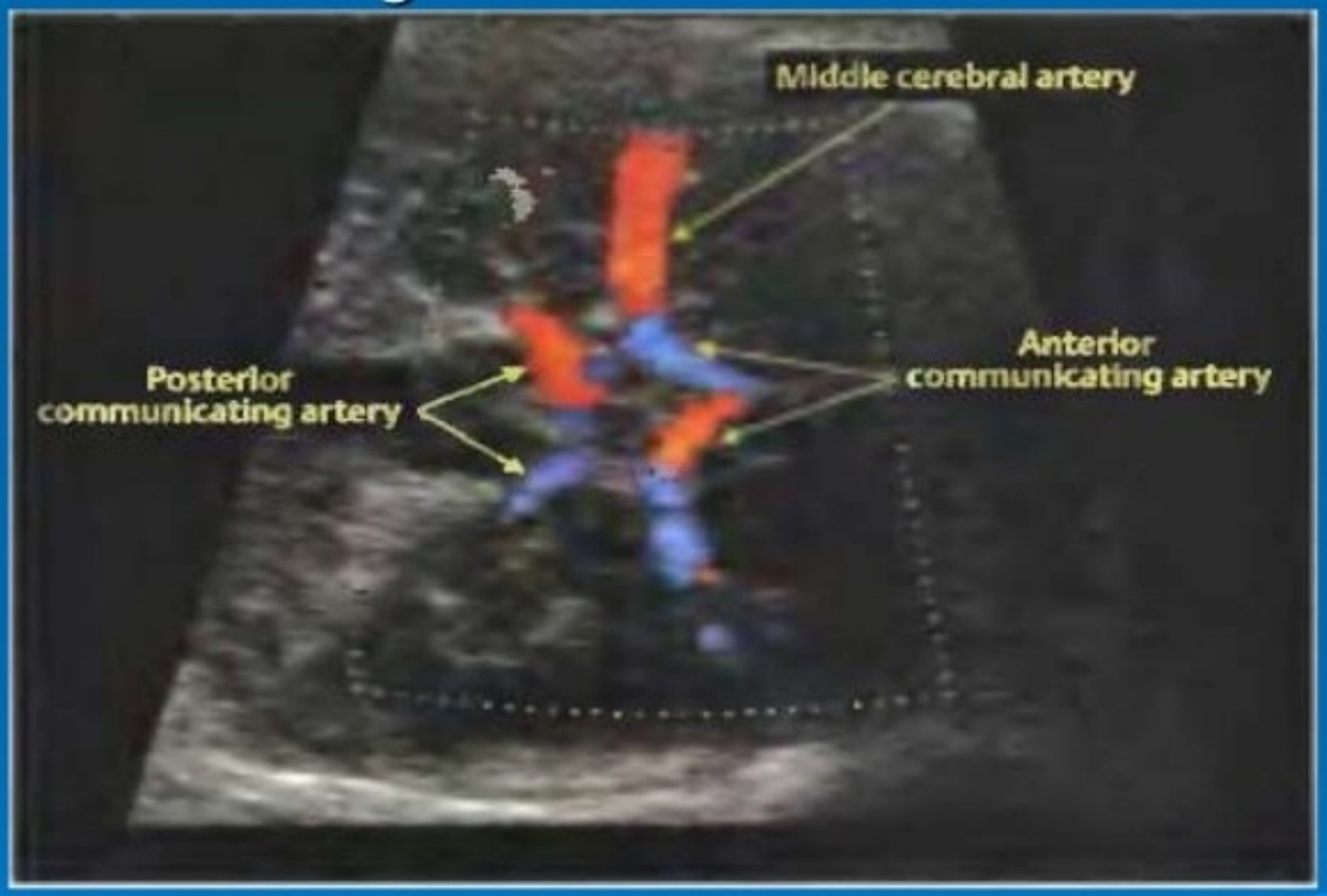
- Use color Doppler to identify circle of Willis
- "Zoom" image to see entire length MCA
- Place cursor close to origin of MCA
- Angle of insonation should be zero
- Do not use angle correction
- Take several measurements (at least three) with 15-30 waveforms

- Velocities should be similar
- Take best measurement
- Do not average several velocities

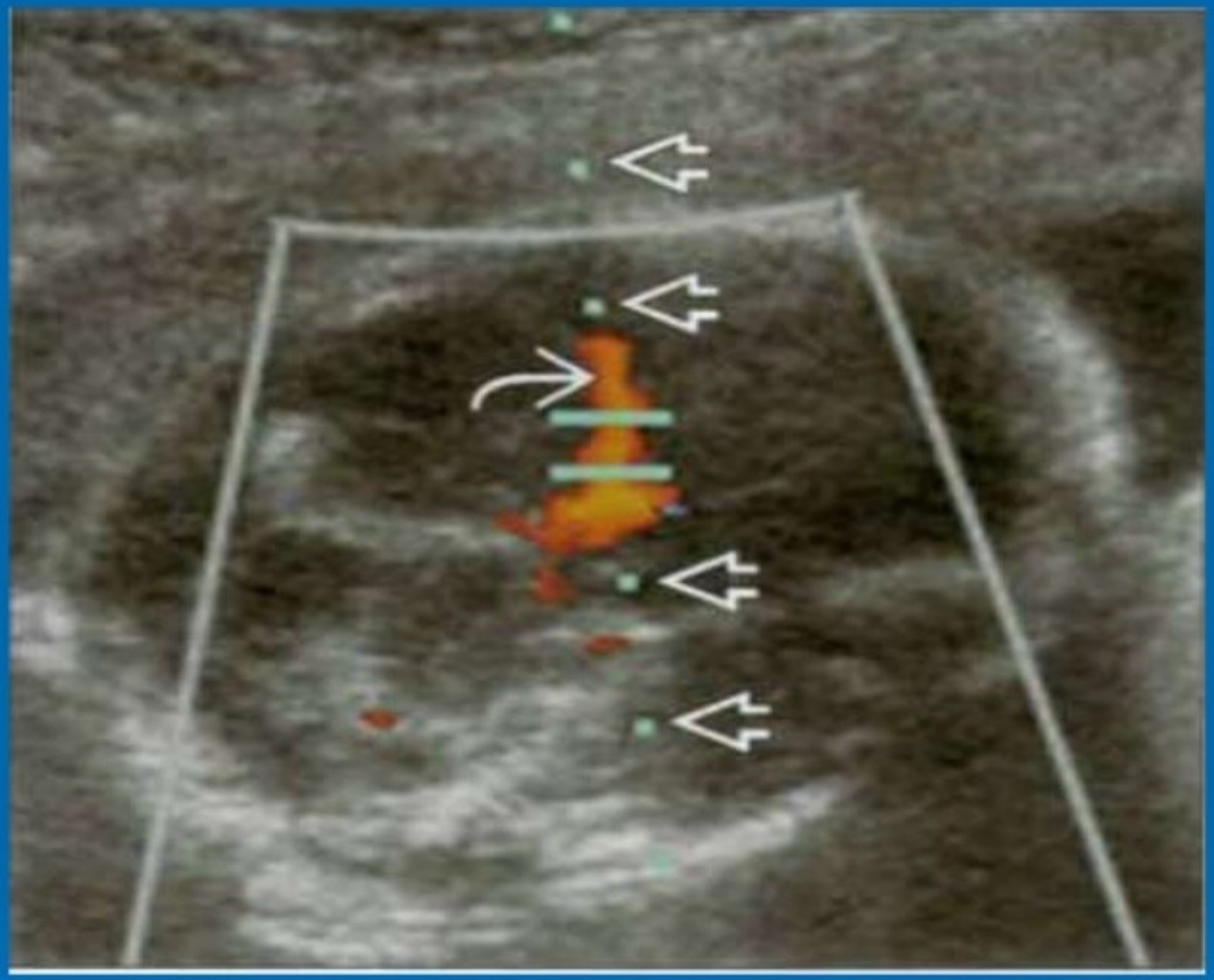
- Avoid sampling during periods of fetal breathing and increased activity

-

The middle cerebral artery is most easily visualized in a transverse plane. First the fetal head is imaged in the standard biometry plane, and then the plane is shifted downward toward the skull base at the level of sphenoid bone. This brings into view the circle of Willis.

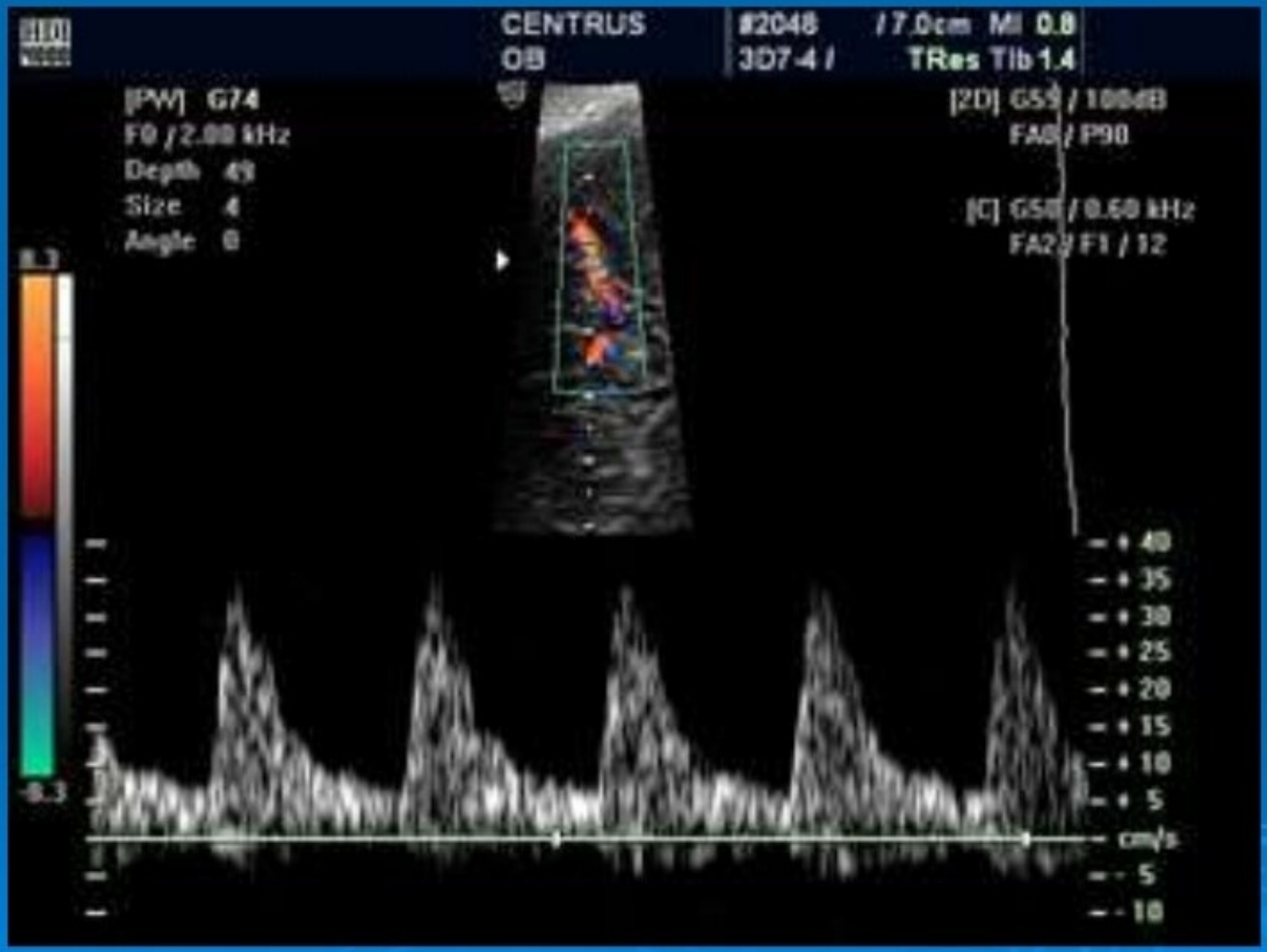


The best site for recording a Doppler spectrum is approximately 2 mm from the circle of Willis or at the origin of the internal carotid artery.



- Axial color Doppler ultrasound shows correct technique for sampling the MCA. There must be no angle between the long axis of the vessel (curved arrow) and the ultrasound beam (open arrows).

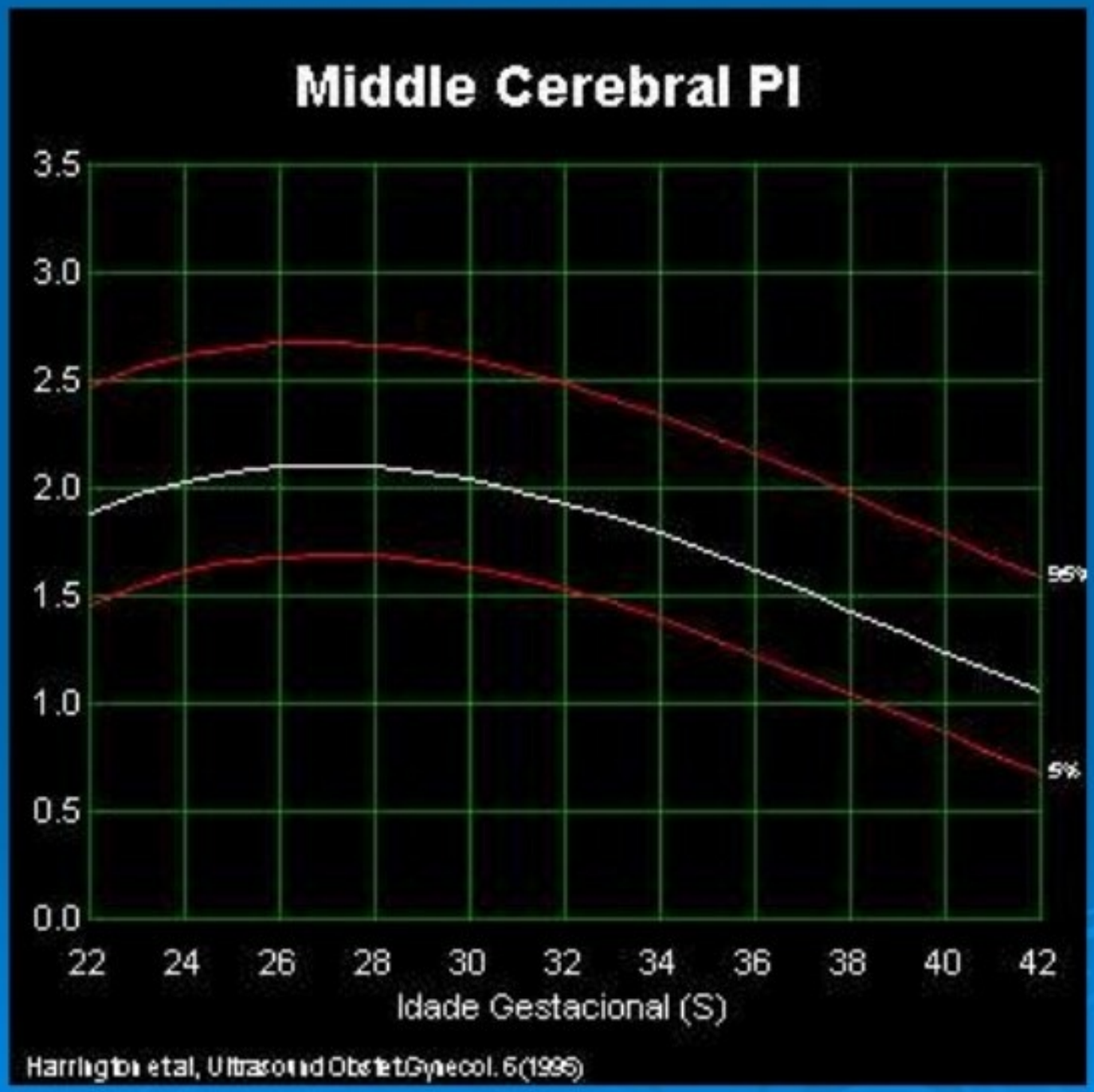
MCA- PD



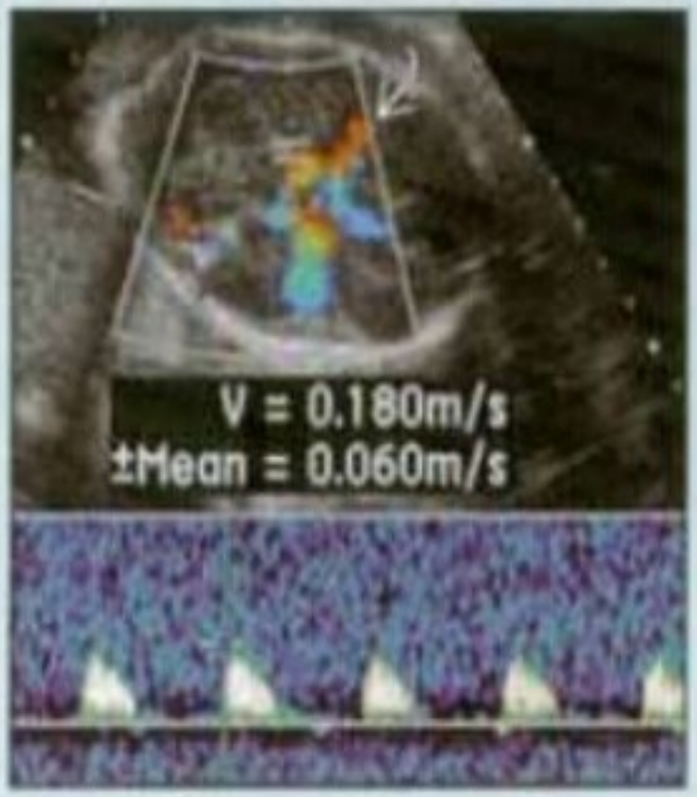
Doppler angle should be between 0-20 degree

Measure peak systole & end diastole & indices are calculated

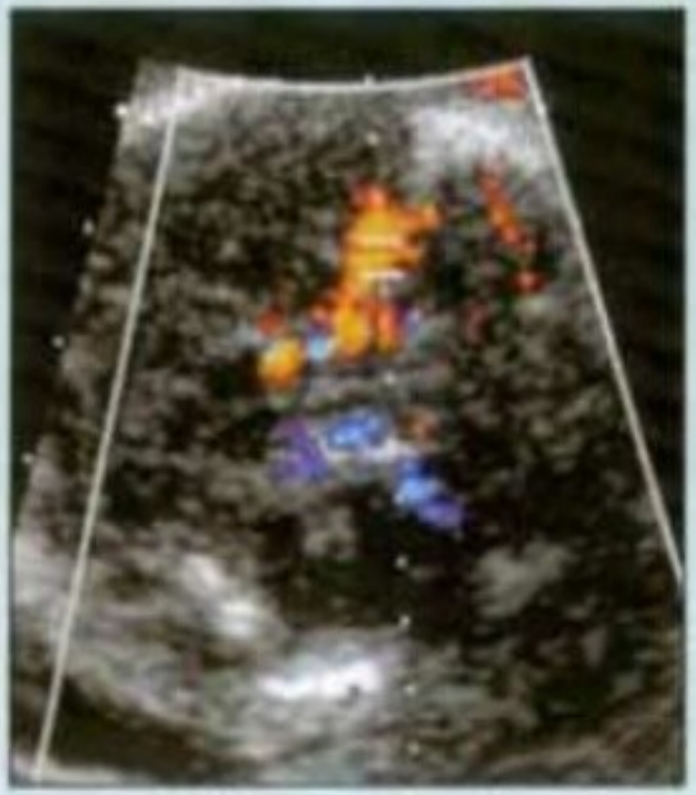
NORMOGRAM & PI ARE IMPORTANT



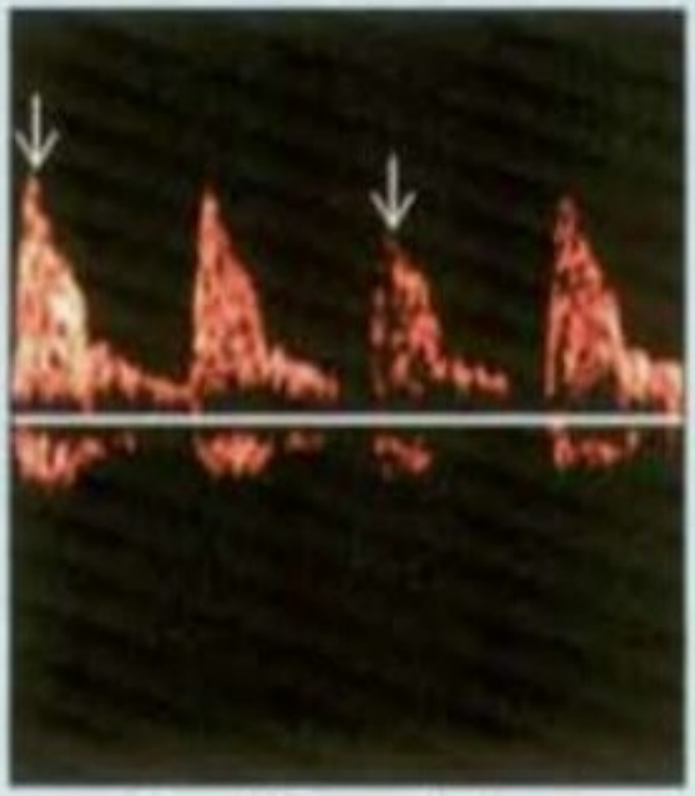
DDx: Errors In MCA PSV Measurement



Wrong Vessel



Wrong Angle



Fetal Breathing

- Hyperactivity of fetus, increase of intrauterine pressure (polyhydramnios), and external pressure to the fetal head (e.g. by the probe) might erroneously increase end diastolic flow velocities

ABNORMAL MCA

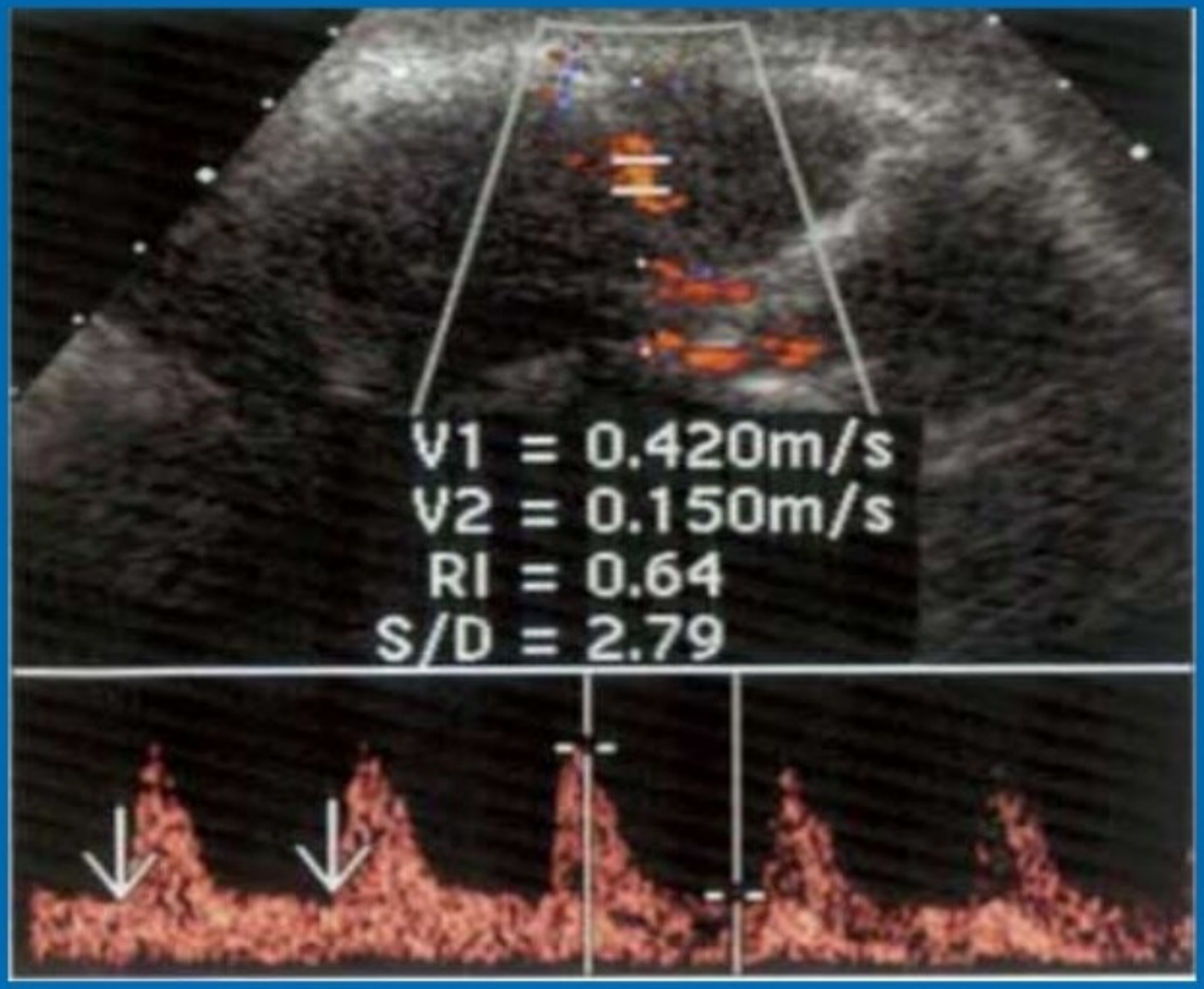
- During hypoxia, fetal compensatory mechanisms cause constriction of the sphlancnic, renal & pulmonary vascular beds with redistribution of arterial blood flow to the cerebrum, myocardium, adrenals. This is reflected in the MCA as increased diastolic flow with reduced RI.

CEREBROPLACENTAL RATIO:

- In normal fetus, the placental vascular resistance decreases as pregnancy advances, whereas the MCA resistance is almost constant
- RI MCA/RI UMB > 1
- Cerebral distribution: MCA RI decreases & UMB RI increases lead to CPR < 1, indicating fetal hypoxia

- Protective mechanism allows increased proportion of umbilical blood flow to go to brain
- With IUGR/hypoxia up to 70% of flow is shunted to brain/coronaries

- ✓ MCA Diastolic flow increases - SD ratio decreases
- ✓ UA SD ratio increases as placental resistance increases
- ✓ Eventually UmA SD ratio > MCA SD ratio = “brain sparing" pattern

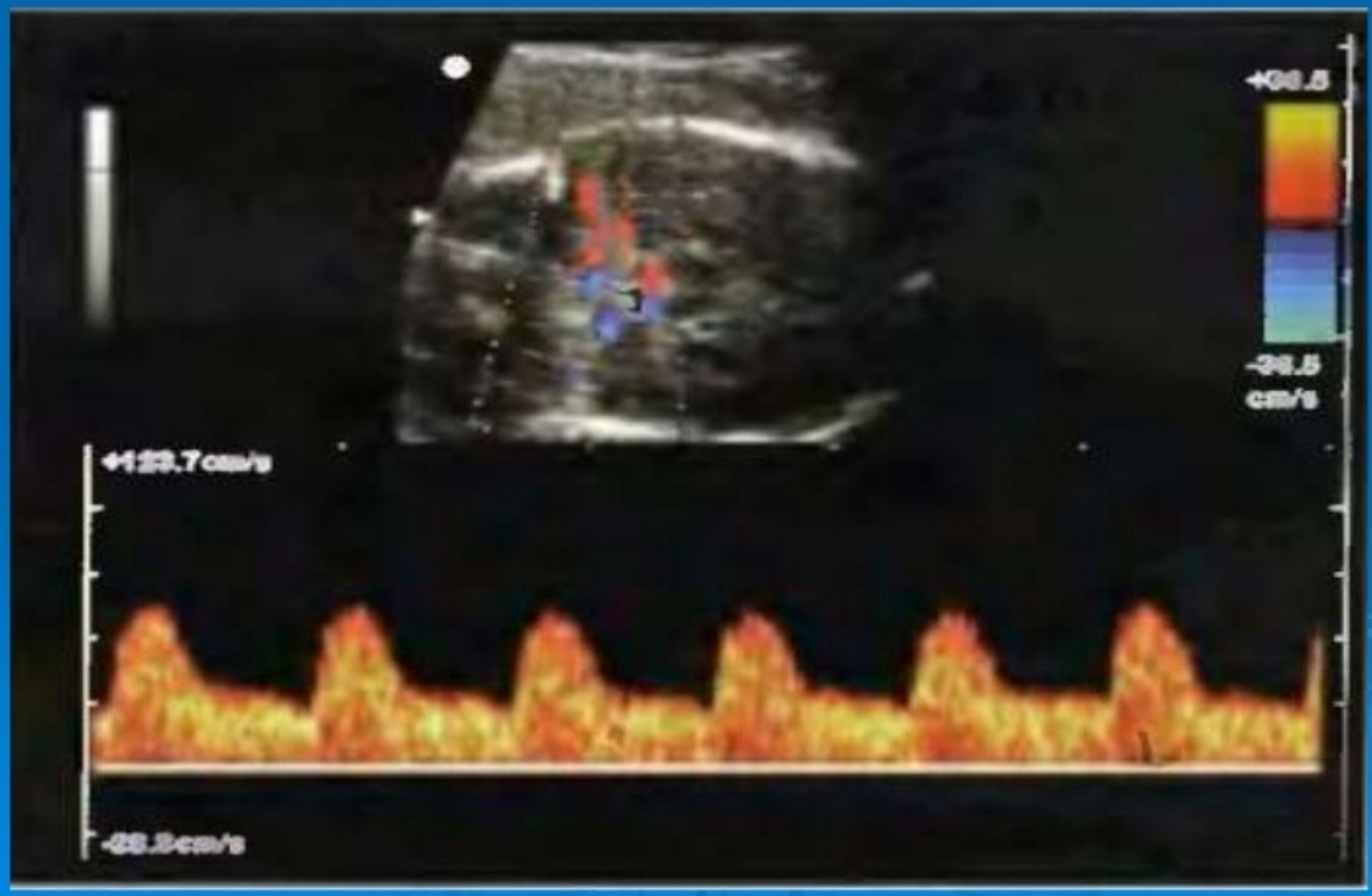


- Pulsed Doppler ultrasound shows abnormal low resistance flow in the MCA in a fetus with growth restriction. The SD ratio of 2.19 was less than that of the UA. Note the prominent antegrade diastolic flow (arrows).

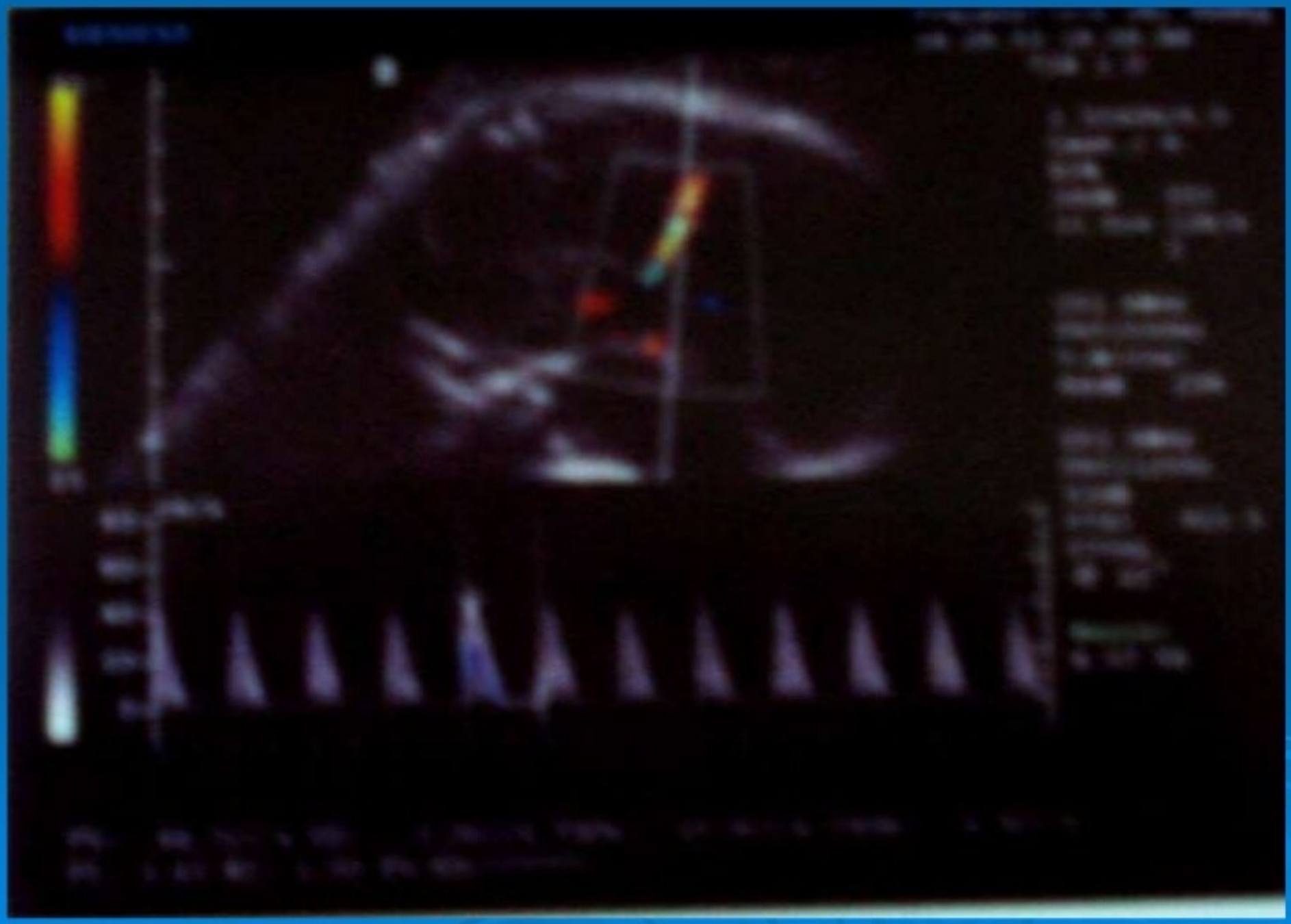
ABNORMAL MCA DOPPLER

- Brain sparing : High diastolic flow, decrease PI
- When O2 deficit is greater,PI tends to rise ,which presumably reflects development of brain edema.
- Reversal in MCA : cerebral edema
- In growth retarded fetus the disappearence of the brain sparing effect or presence of reversed MCA flow is a critical event for the fetus and precedes fetal death.

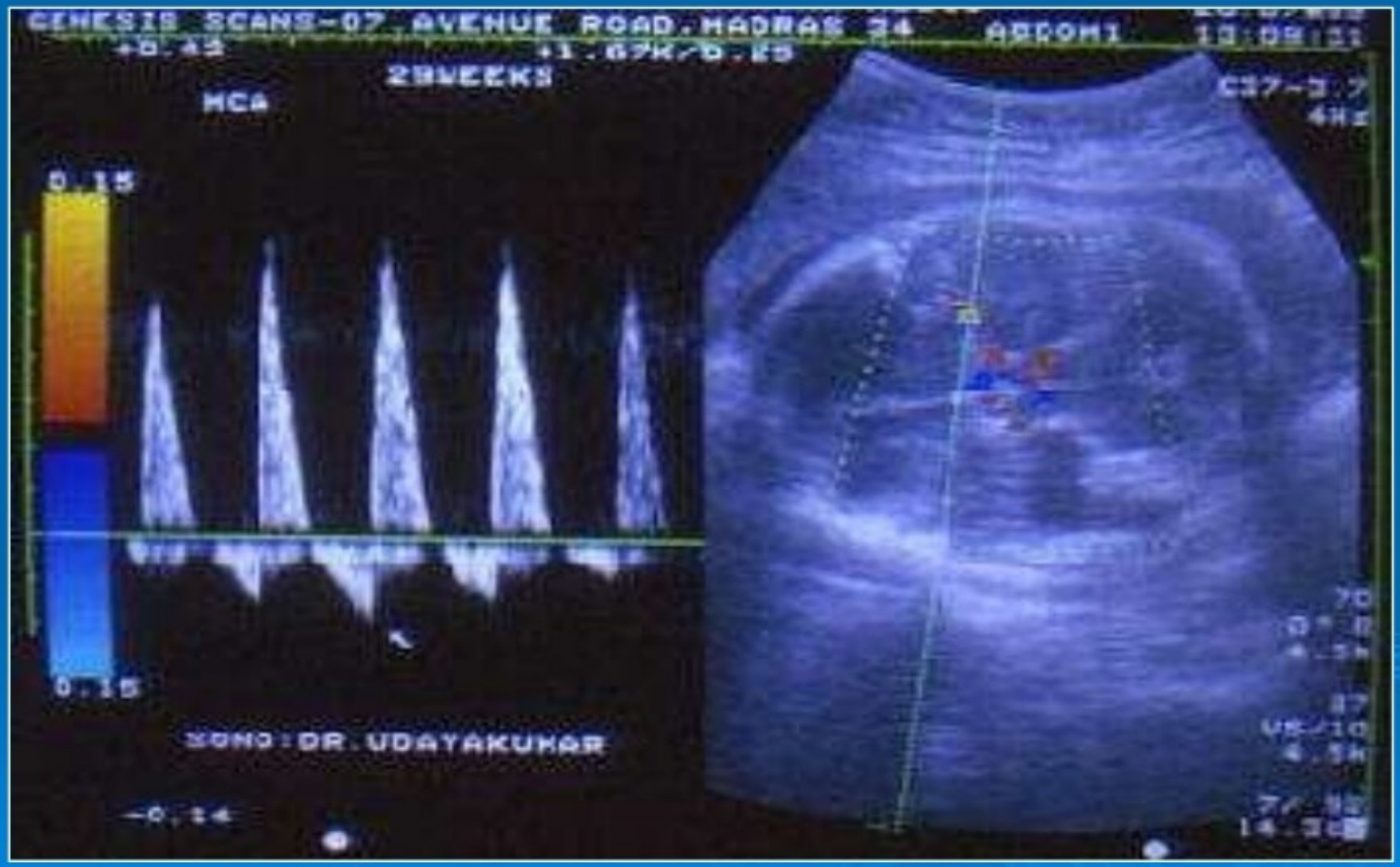
Abnormal frequency spectrum recorded from the middle cerebral artery with color Doppler in a fetus with severe intrauterine growth retardation at 27 weeks. This waveform pattern, called the brain-sparing effect, is characterized by increased end-diastolic flow velocities.



ABSENT DIASTOLIC BLOOD FLOW IN MCA



REDF IN MCA


GENESIS SCANS-07,AVENUE ROAD,MADRAS 24
MCA
0.15
0.15
DR.UDAYAKUMAR

MCA flow

- MCA is more sensitive to hypoxia than umbilical artery.
- MCA response to fetal hypoxia is instant.

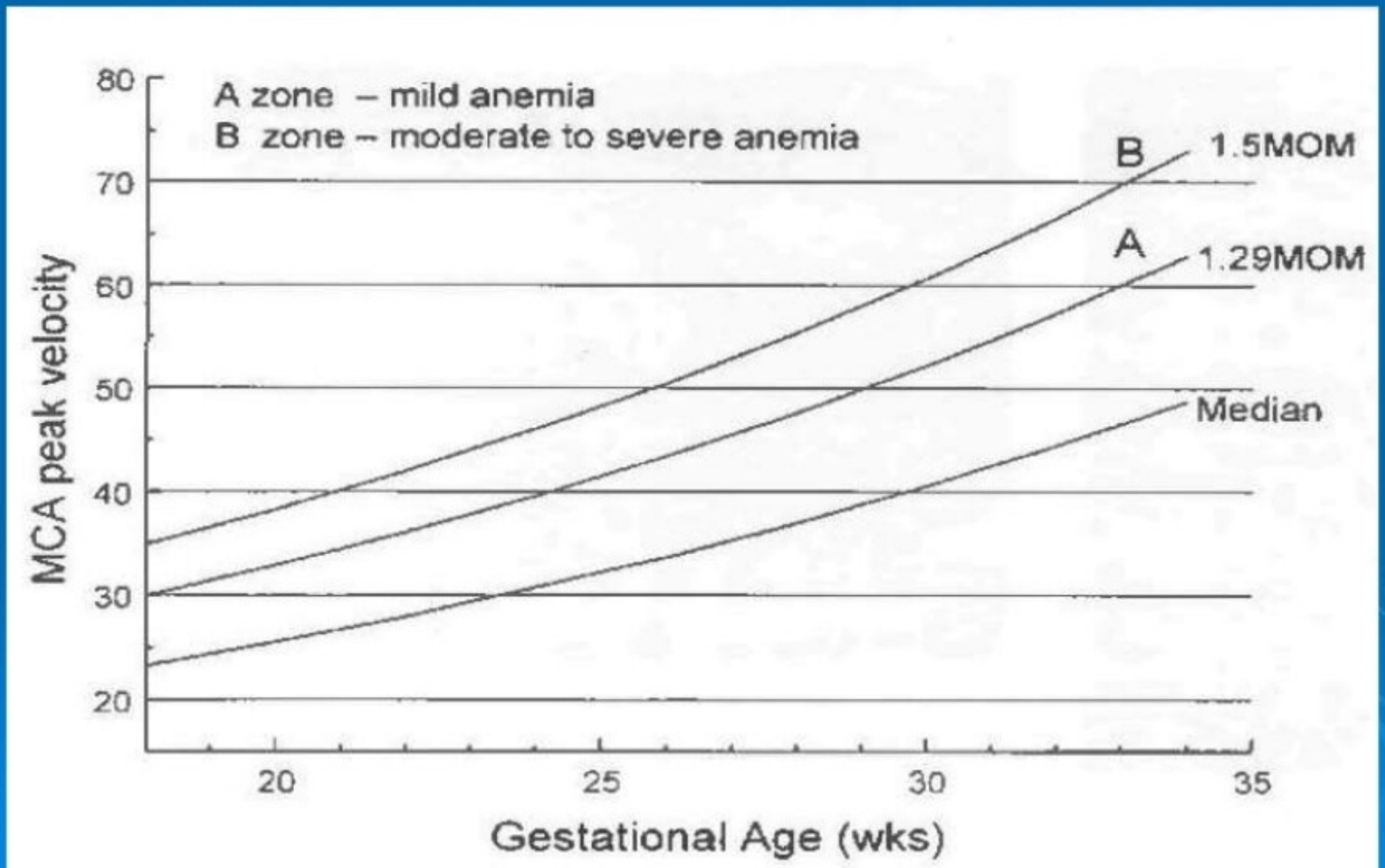
- High systole in MCA → fetal anemia
- High diastole in MCA → brain sparing effect in fetal hypoxia

Role of MCA doppler in evaluation of fetal anemia

- This concept is based on animal data indicating that fetal blood velocities become elevated in response to an increase in cardiac output and a decline in blood viscosity when the fetus becomes anemic.
- Mari and coworkers are credited with the first description of using the peak systolic velocity in the middle cerebral artery to detect fetal anemia.

- Because the normal peak systolic velocity in this vessel increases with advancing gestational age, the value in cm/s must be converted to multiples of the median (MoMs).
- An middle cerebral artery (MCA) velocity of greater than 1.50 MoMs detected all cases of moderate to severe anemia.
- MCA doppler velocimetry was determined to be more accurate than amniocentesis in detecting severe fetal anemia.

Fetal MCA velocity determinations can be initiated as early as 18 weeks' gestation once the fetus is at risk for the development of anemia. Doppler studies are repeated every 1 to 2 weeks based on the trend in the data



Expected Peak Velocity of Systolic Blood Flow in the Middle Cerebral Artery as a Function of Gestational Age

	Multiples of the Median			
	1.00 (Median)	**1.29**	**1.50**	**1.55**
Week of Gestation	Peak Velocity in cm/sec			
18	23.2	29.9	34.8	36.0
20	25.5	32.8	38.2	39.5
22	27.9	36.0	41.9	43.3
24	30.7	39.5	46.0	47.5
26	33.6	43.3	50.4	52.1
28	36.9	47.6	55.4	57.2
30	40.5	52.2	60.7	62.8
32	44.4	57.3	66.6	68.9
34	48.7	62.9	73.1	75.6
36	53.5	69.0	80.2	82.9
38	58.7	75.7	88.0	91.0
40	64.4	83.0	96.6	99.8

From Mari G, Deter RL, Carpenter RL, et al: Noninvasive diagnosis by Doppler ultrasonography of fetal anemia due to maternal red-cell alloimmunization. N Engl J Med 342:9, 2000.

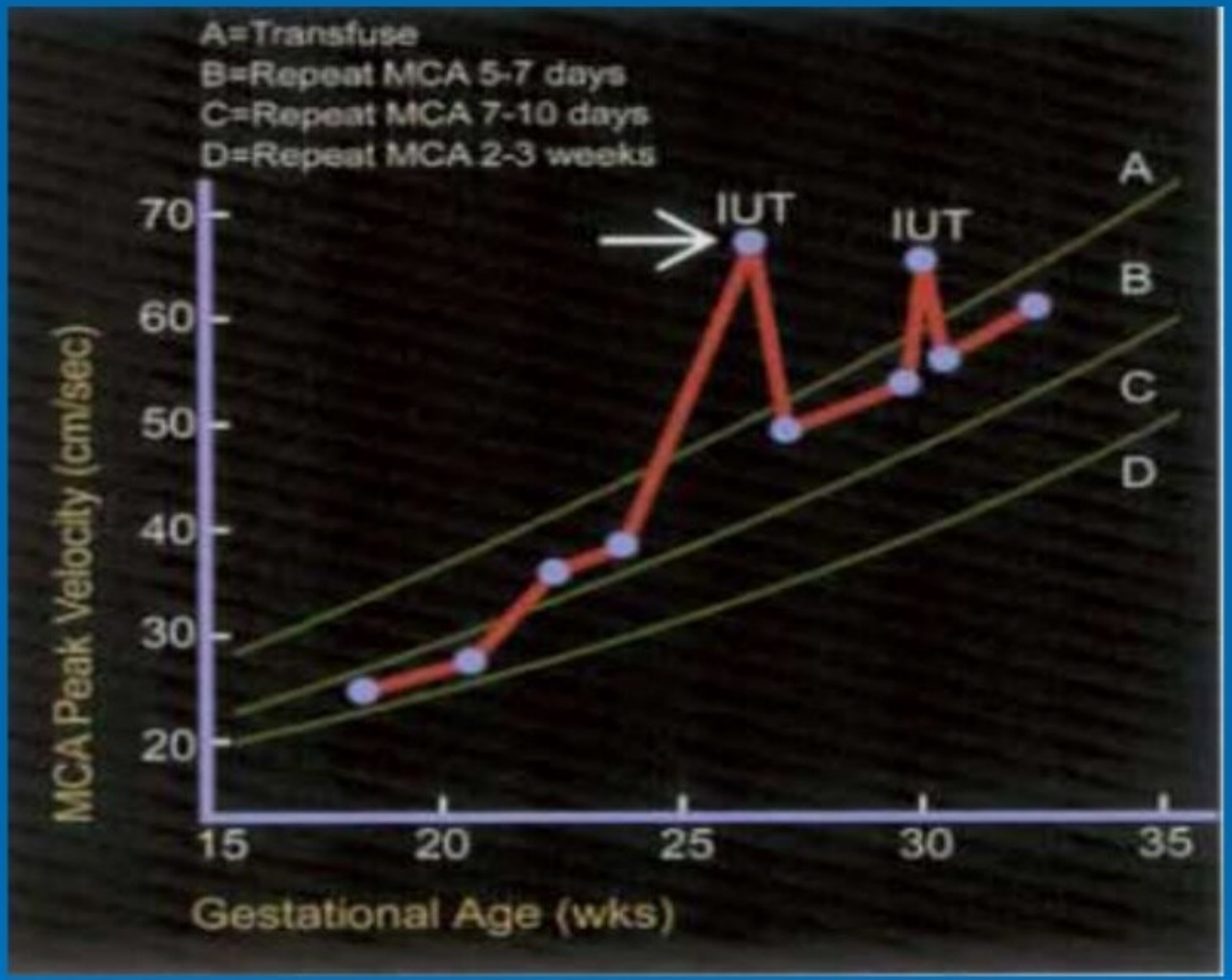
Threshold of the Peak Velocity of the Middle Cerebral Artery (cm/sec) Above Which Degree of Anemia is Classified

Gestation (wks)	Mild Anemia	Moderate Anemia	Severe Anemia
18	29.9	34.8	36.0
20	32.8	38.2	39.5
22	36.0	41.9	43.3
24	39.5	46.0	47.5
26	43.3	50.4	52.1
28	47.6	55.4	57.2
30	52.2	60.7	62.8
32	57.3	66.6	68.9
34	62.9	73.1	75.6
36	69.0	80.2	82.9
38	75.7	88.0	91.0
40	83.0	96.6	99.8

Treatment of anemia

- Monitor velocities
- Plot measurements of MCA PSV in cm/sec against gestational age in weeks
- Intervention based on relationship of velocity to GA

- Zone A: Intervene
- Zone B: Repeat measurements in 5-7 days
- Zone C: Repeat measurements in 7-10 days
- Zone D: Repeat measurements in 2-3 weeks



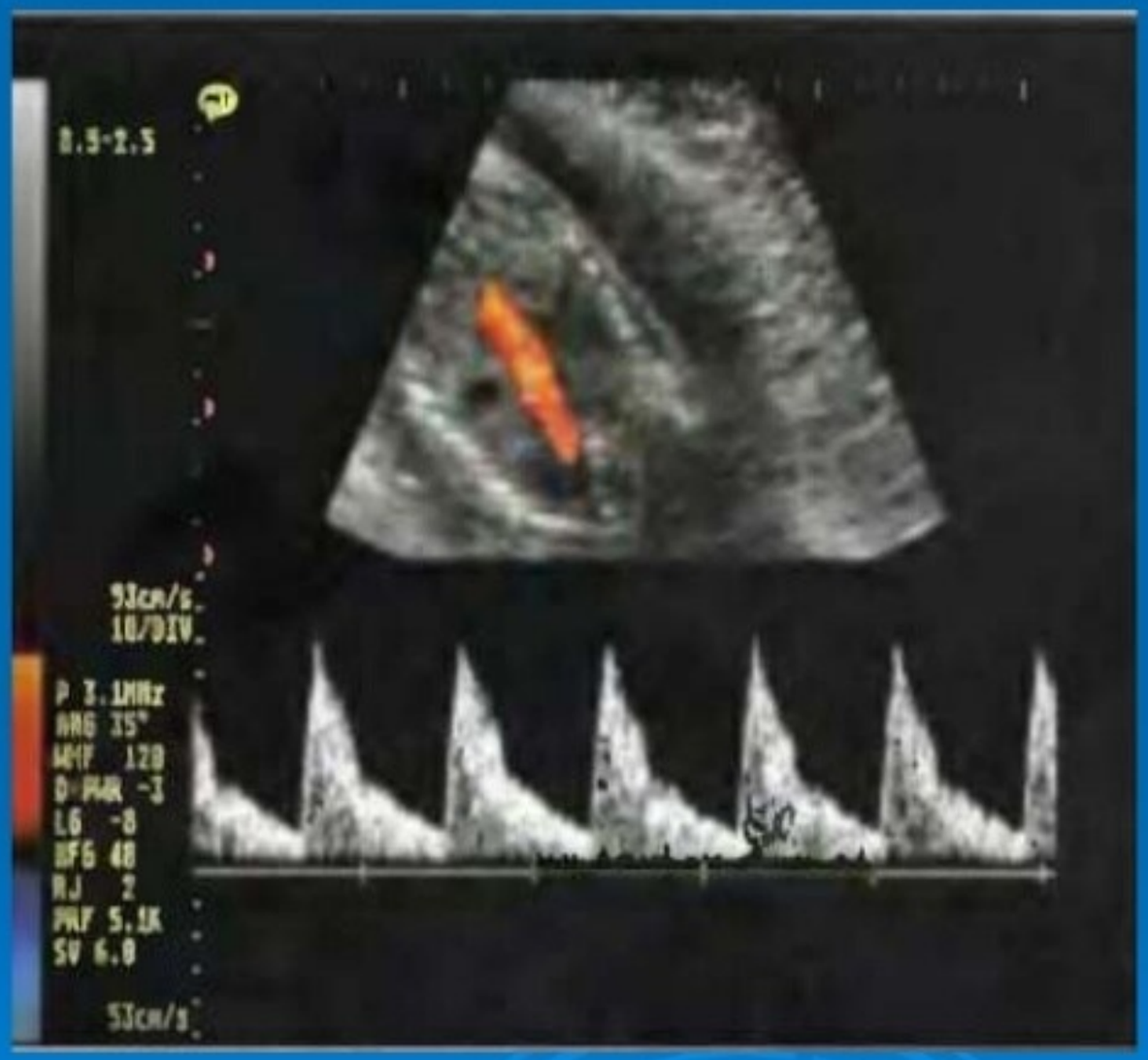
Graphic of MCA PSV plots in a Rh-sensitized patient. The length of interval follow-up is based on the zone in which the PSV plots. Intrauterine transfusion (IUT - arrow) was performed when the fetus was in zone A with a subsequent drop in PSV

- Use of MCA Doppler has changed management of pregnancies complicated by alloimmunization

- ✓ Serial amniocentesis no longer required
- ✓ Less risk of procedure-related pregnancy loss
- ✓ Less risk fetal-maternal hemorrhage

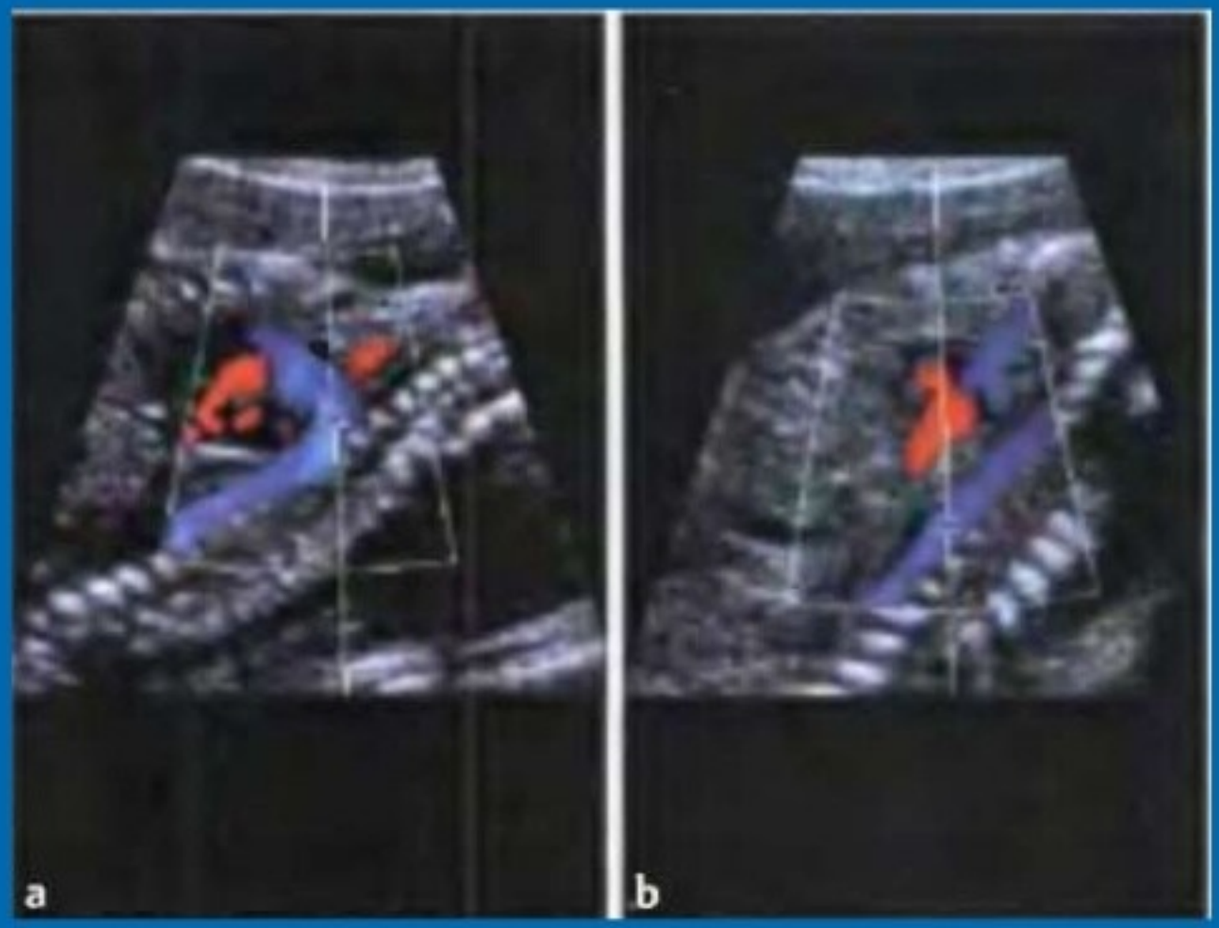
Fetal aorta


IVC
descending aorta

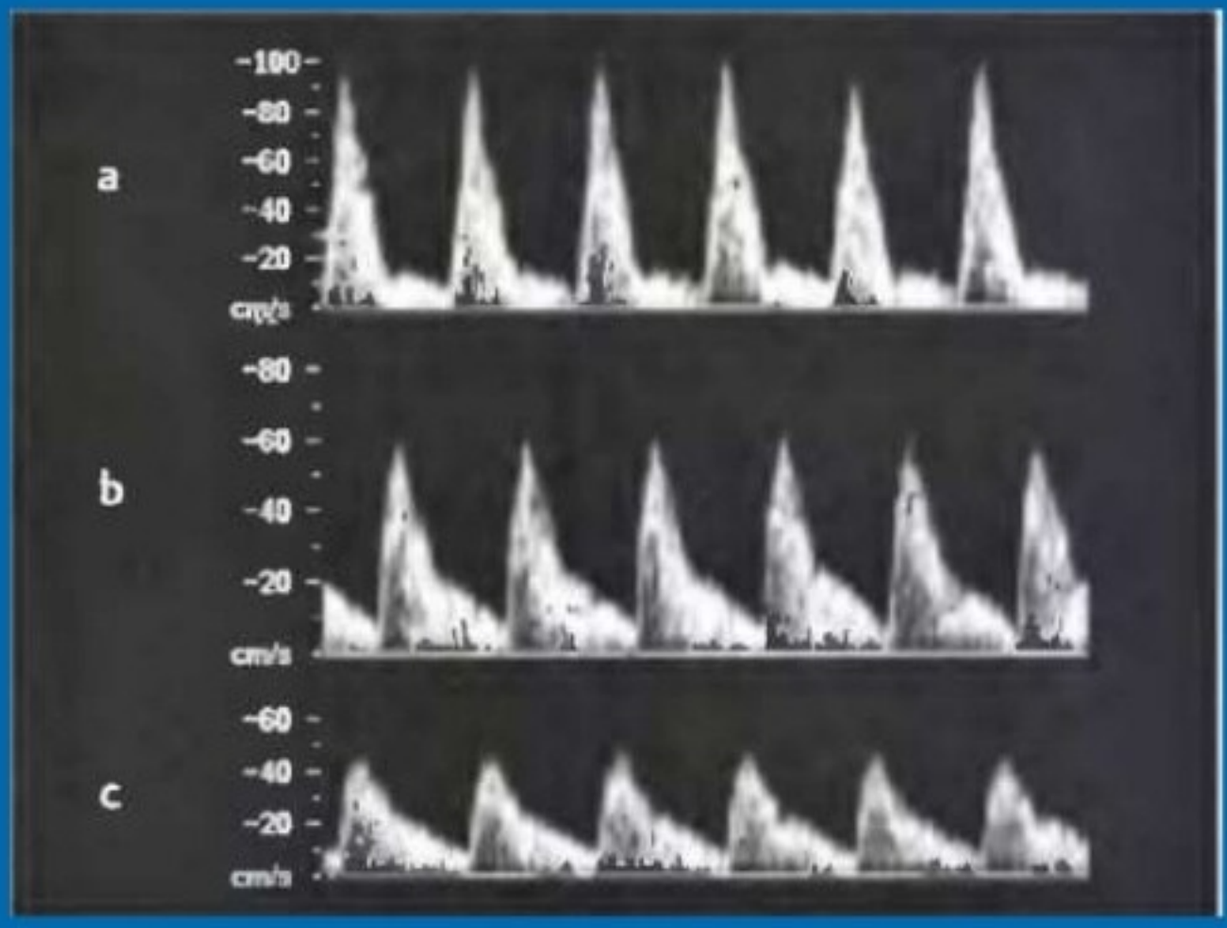

8.5-2.5
93cm/s
10/DIV
P 3.1MHz
ANG 35°
DYN 120
D-PWR -3
LG -8
WF6 48
RJ 2
PRF 5.1K
SV 6.0
53cm/s

Aorta

- The waveform of the fetal aorta is characterized by a steep systolic up slope with a postsystolic notch and by relatively low antegrade end-diastolic flow velocities.
- The systolic upstroke phase (acceleration time) reflects the contractility of the heart and the subsequent diastolic phase reflects the peripheral vascular resistance.
- Usually doppler spectrum is recorded in sagital plane at the level of diaphragm with insonation angle less than 30 degree



Placement of the sample volume for recording an aortic Doppler spectrum.
a In the aortic arch.
b In the descending aorta at the level of the diaphragm (= reference plane).

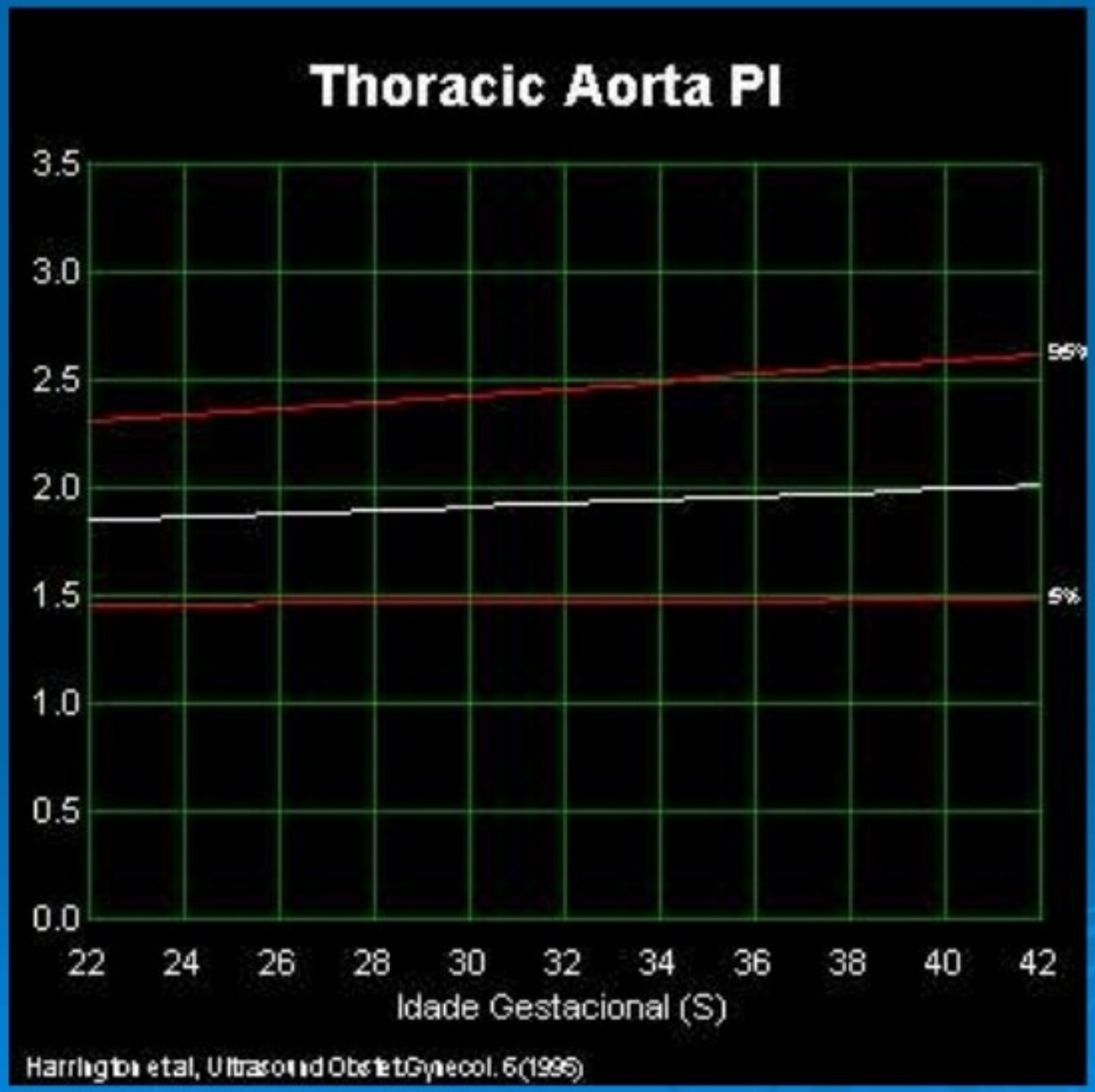


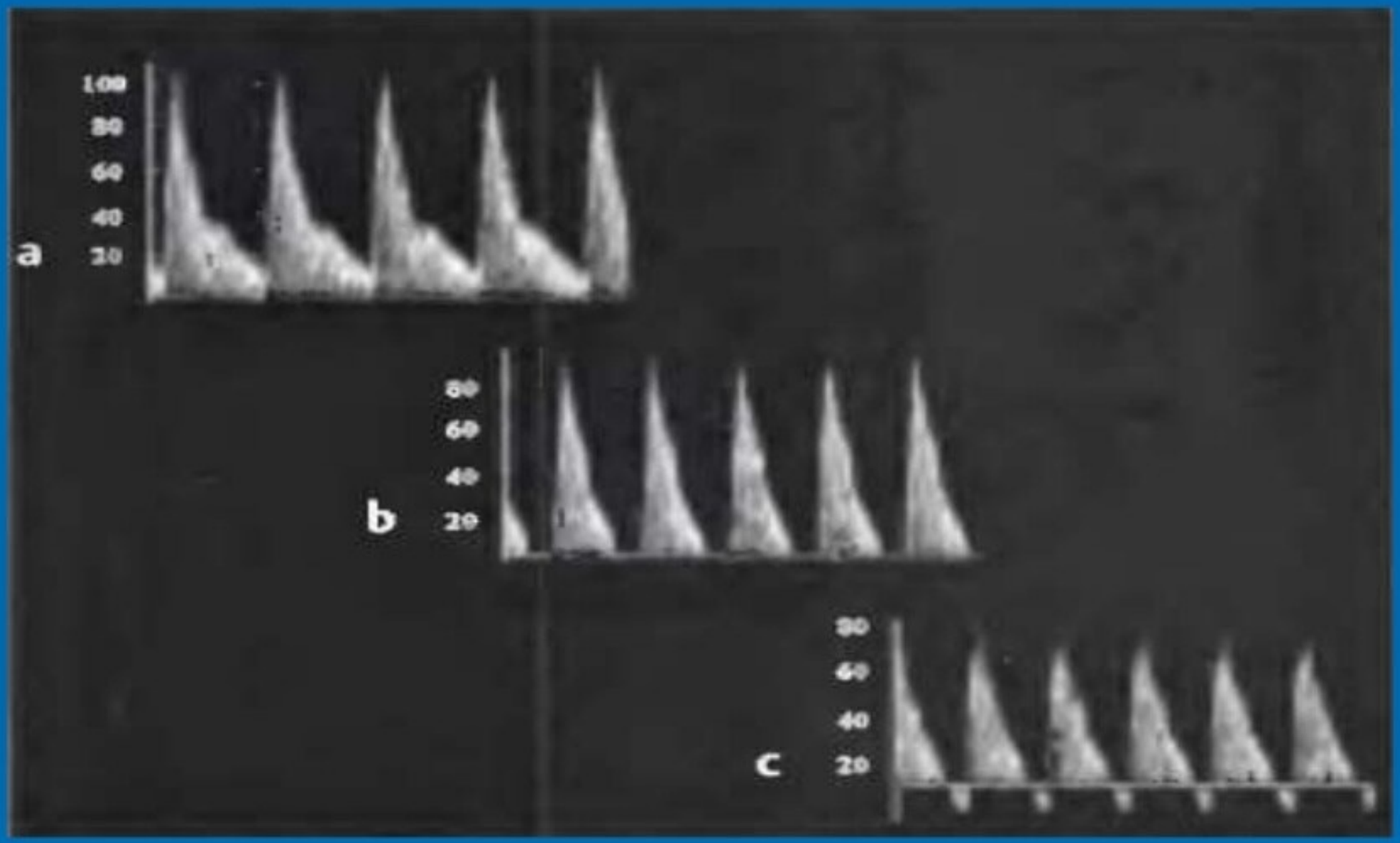
Doppler spectra recorded from various sites in the fetal aorta.

- a - Level of the aortic arch.
- **b** = level of the diaphragm.
- c = below the renal vessels.

The pulsatility of the aortic blood flow decreases with increasing distance from the heart.

Normogram


Thoracic Aorta PI
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
95%
5%
22
24
26
28
30
32
34
36
38
40
42
Idade Gestacional (S)
Harrington et al, Ultrasound Obstet Gynecol. 6(1995)



Normal and abnormal Doppler spectra recorded from the fetal aorta at the level of the diaphragm.

- a Normal Doppler spectrum.
- b Zero diastolic flow.
- c Reverse flow.

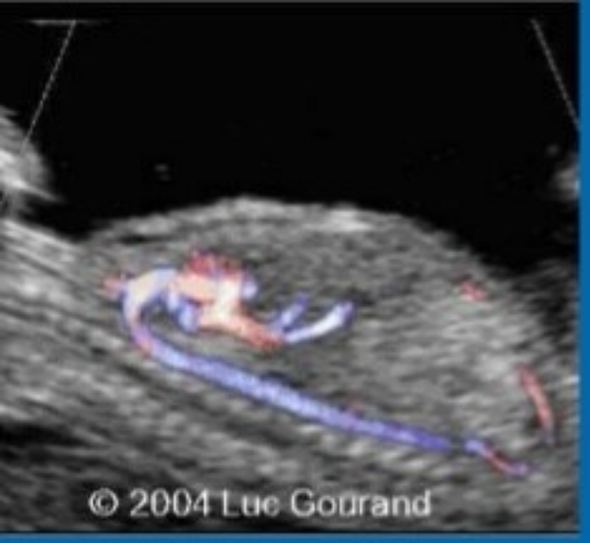
semiquantitative visual classification of the aortic Doppler spectrum into various blood flow classes. These classes are as follows:

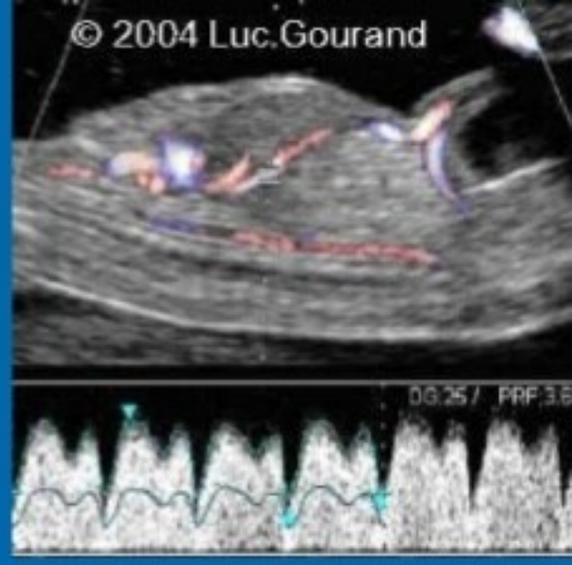
Class of blood flow	Doppler findings
class 0	Normal frequency spectrum of the foetal aorta with normal resistance indices
class I	End-diastolic flow velocities decreased, resistance indices increased above normal
class II	Slight loss of end-diastolic flow
class III	Complete loss of end-diastolic flow
class IV	Reverse end-diastolic flow

Blood flow classes III and IV in particular appear to correlate with abnormal FHR patterns

Interpretation of fetal arterial Doppler

- A growth-restricted fetus would usually develop abnormal umbilical artery waveforms before developing fetal arterial redistribution.
- Severe fetal redistribution would normally be followed, within 2 weeks, by the development of reduced biophysical profile, abnormal venous Dopplers or suboptimal cardiotocography. Hence, it is usual at this stage to perform one or more of the latter tests on a frequent basis





FETAL VENOUS DOPPLER

DUCTUS VENOSUS
IVC
HEPATIC VEIN
UMBILICAL VEIN

DV DOPPLER IDENTIFY WHAT IS HAPPENING IN THE HEART

- Of all the precardial veins, the ductus venosus yields the best and most reliable information on fetal myocardial hemodynamics and cardiac function while providing reproducible spectra.

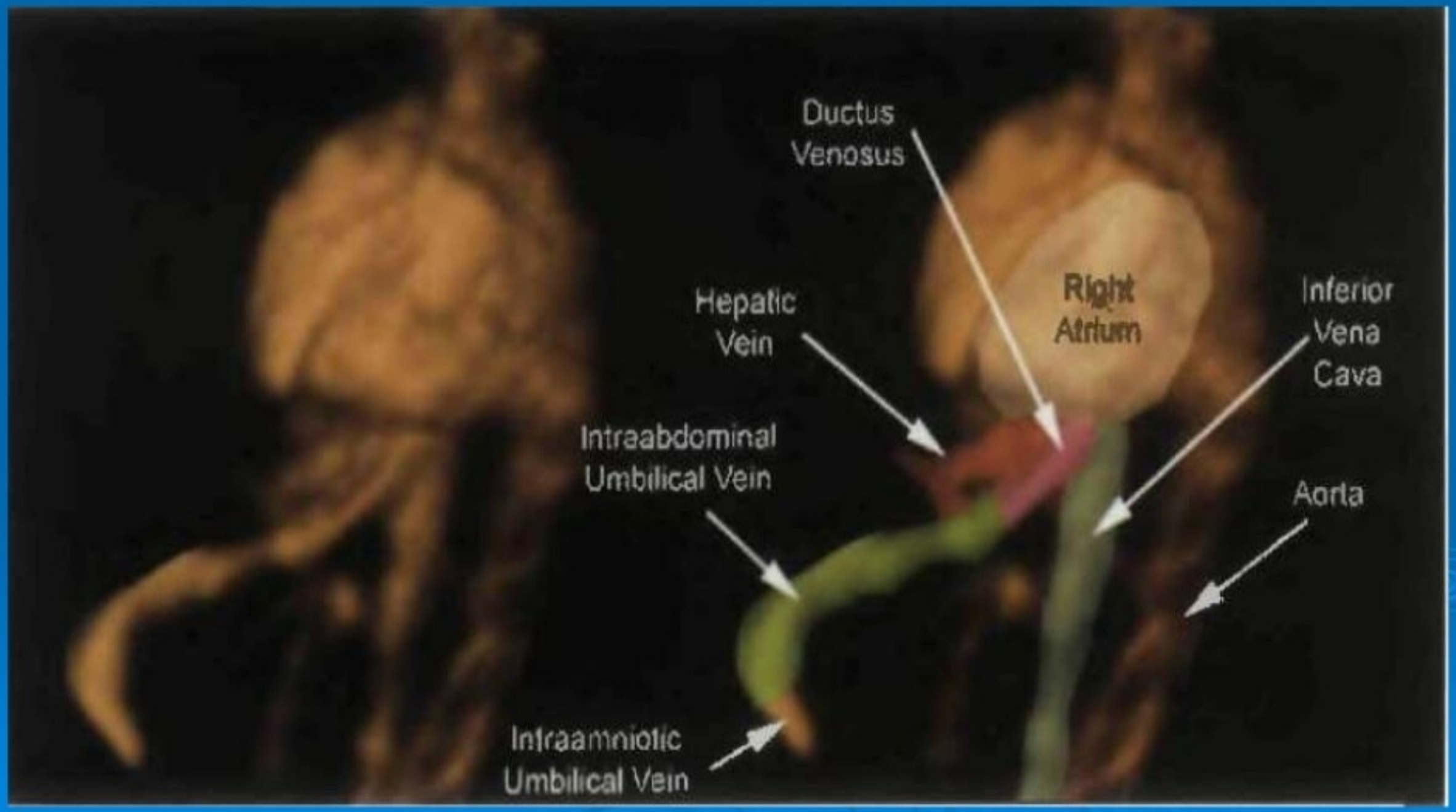
- DV transports oxygenated blood from umbilical vein to the right atrium & ventricle,then to myocardium & brain.

- DV doppler reflects right ventricular preload.

ANATOMY:

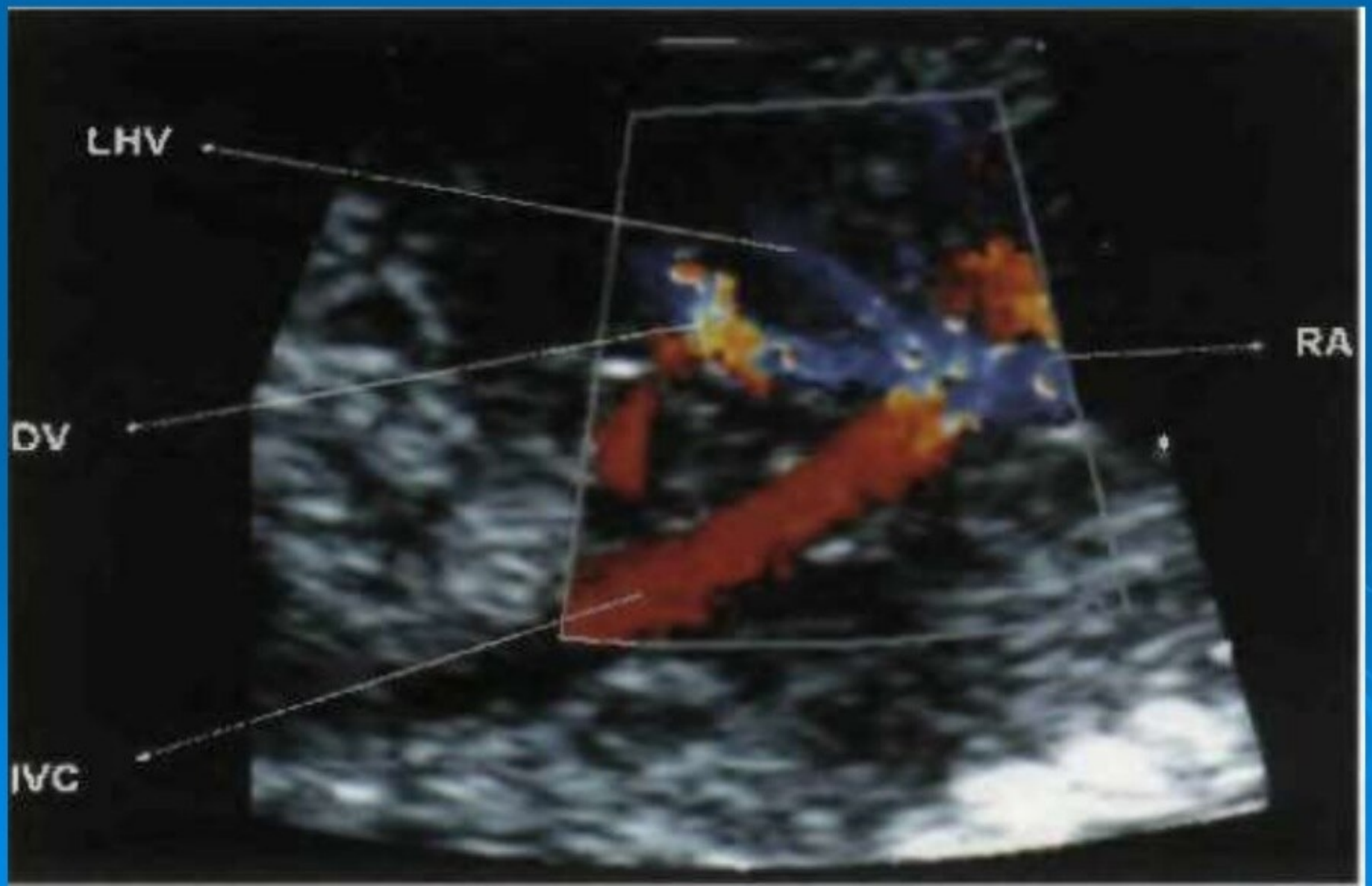
- Trumpet shape
- Arises from transverse portion of left Portal vein or umbilical sinus & connected to IVC
- Funnel shape, length 2 cm, ≤ 2mm wide
- It has muscular coat & sphyncteric action
- Direction: caudocranial, ventrodorsal
- 45% of blood from the umbilical vein via IVC through the DV, bypassing the liver
- Best image of DV in dorsoposterior position

Three-dimensional B flow image from a 17-week-old fetus illustrating the relationships of the venous system, heart and aorta.

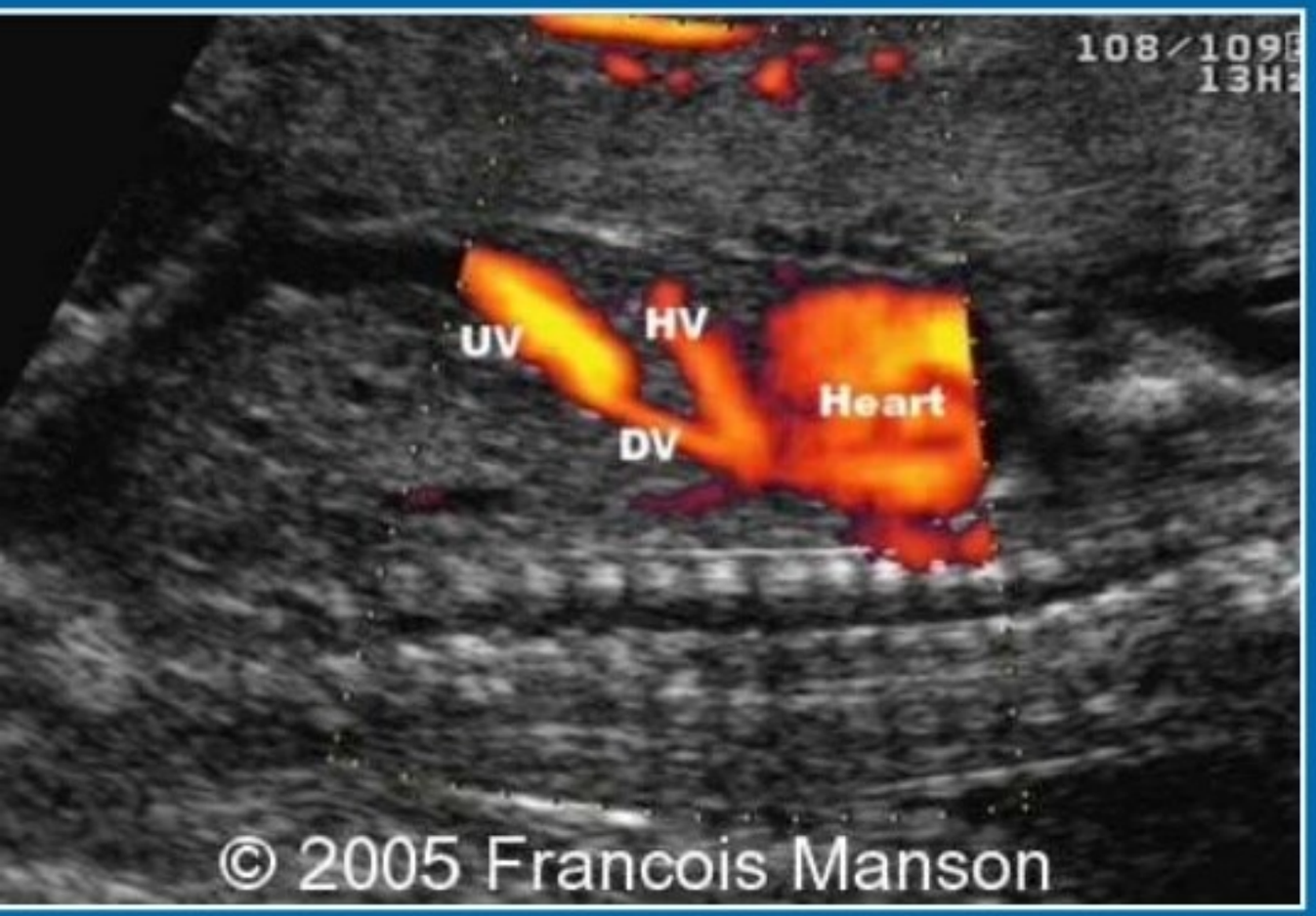


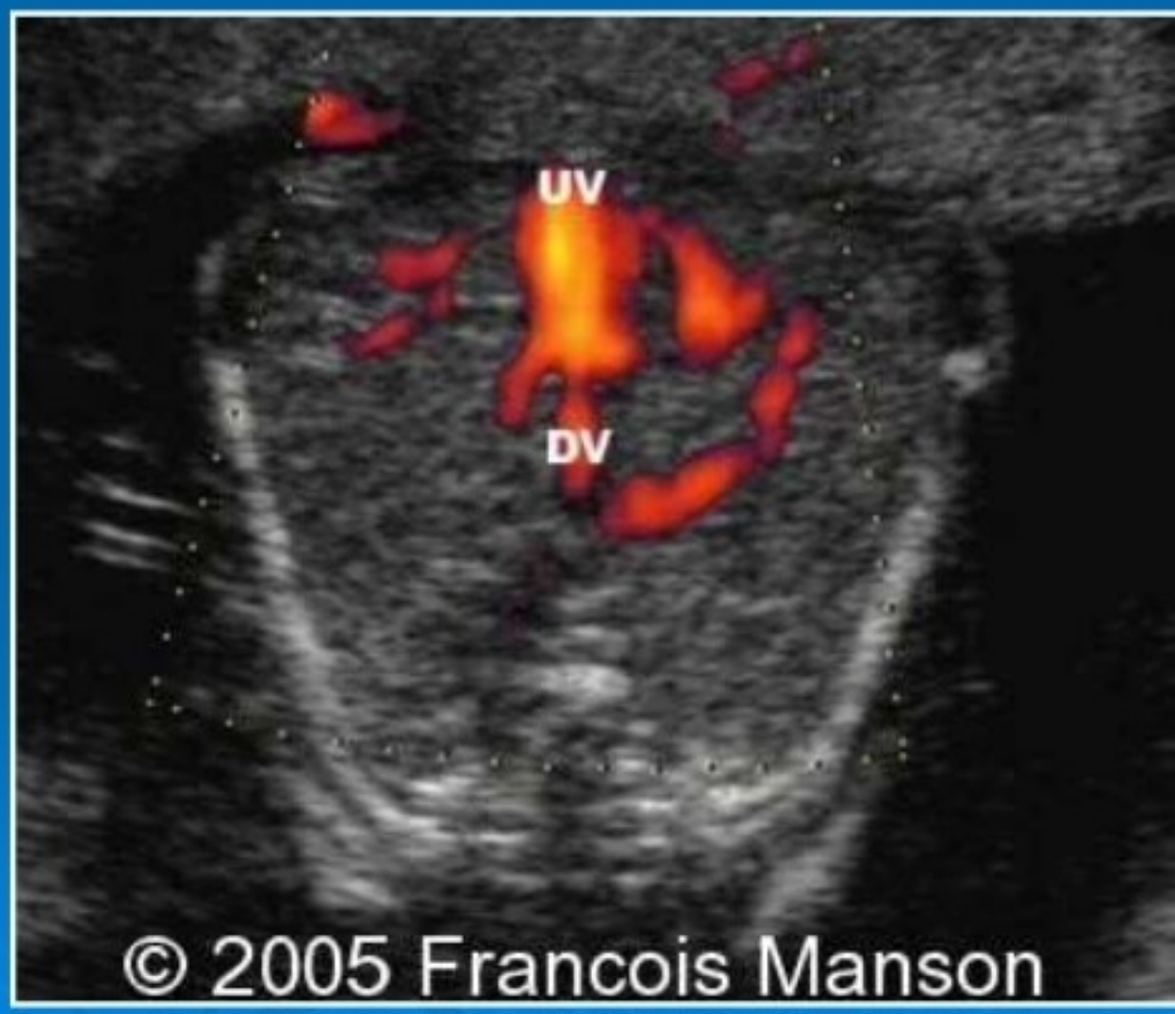
- DV is identified in the trasverse [at the level of the portal vein] or sagittal section of fetal abd.
- The intrahepatic segment of the umbilical vein should be imaged first to gain rapid venous orientation.
- The vein is optimally visualized either in the midsagittal plane or in an oblique transverse scan through the fetal abdomen (95). The intrahepatic segment of the umbilical vein points to the site where the vein enters the ductus venosus.
- Following left portal vein as a ’c’ curve in liver , will bring the DV into view.

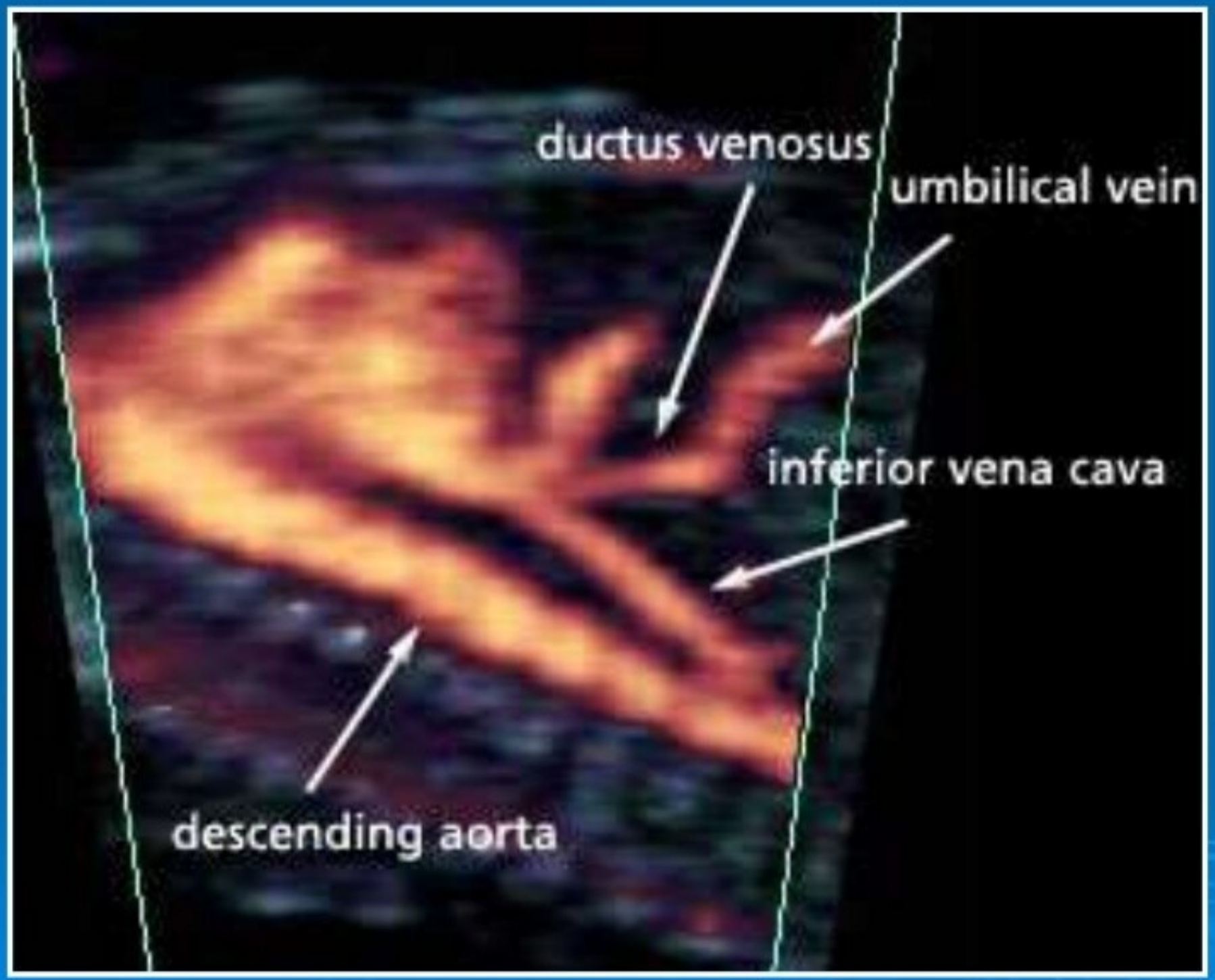
Color Doppler ultrasound of a coronal plane of the fetal abdomen and chest showing the inferior vena cava (IVC). joined by the ductus venosus (DV) and the left hepatic vein (LHV) as it enters the right atrium (RA).



DV


UV
HV
Heart
DV
© 2005 Francois Manson


UV
DV
© 2005 Francois Manson

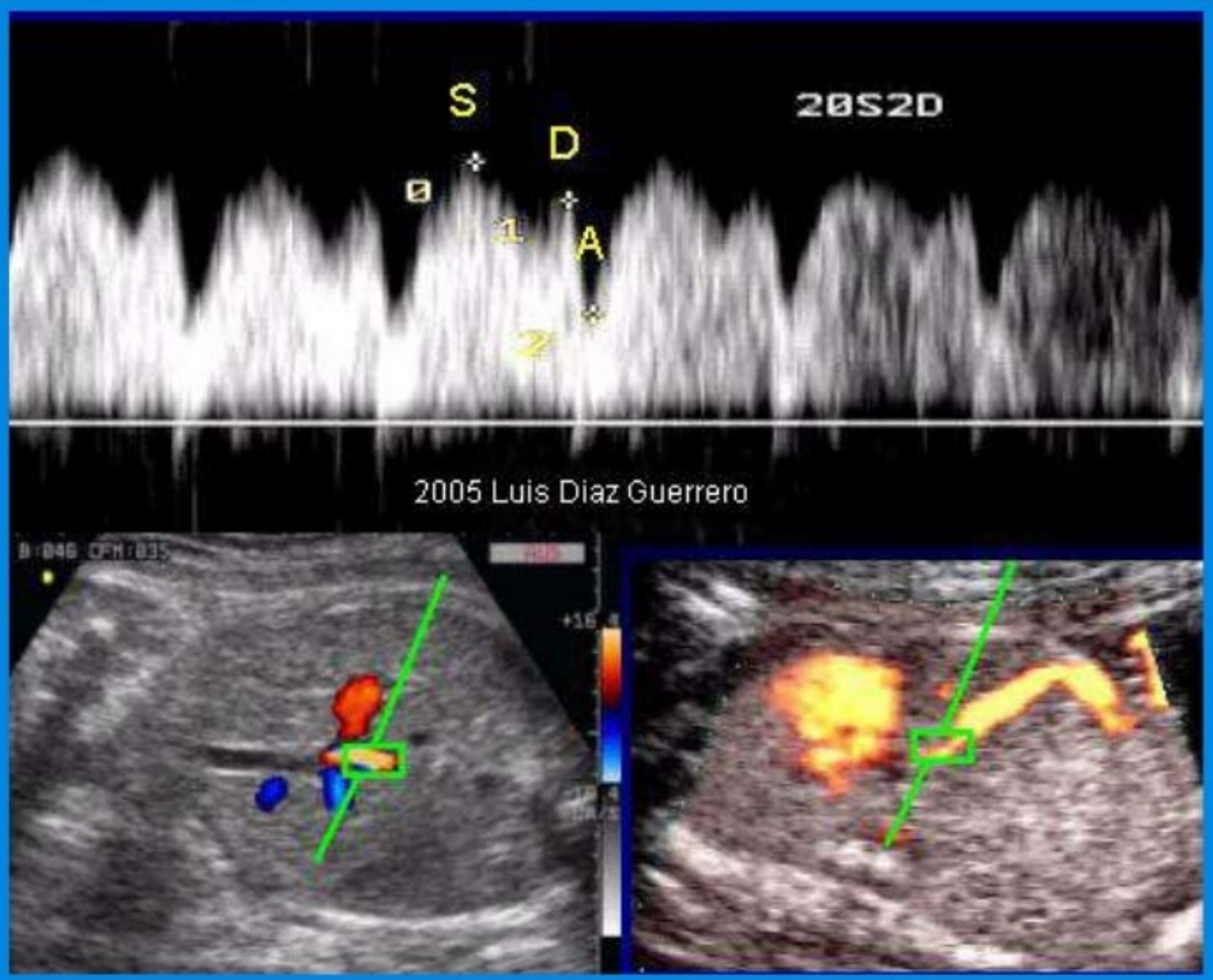

ductus venosus
umbilical vein
inferior vena cava
descending aorta

How to sample DV?

- To record flow signals. the sample volume is positioned directly at the junction of the umbilical vein with the ductus venosus.
- The width of the sample volume (approximately 2.5-6 mm) should just span the vessel; otherwise it would detect unwanted signals from the closely adjacent hepatic veins and umbilical vein.
- The use of color Doppler makes it considerably easier to locate the ductus venosus and accurately position the sample volume. The color-flow image will clearly reveal the difference in flow velocity between the umbilical vein and ductus venosus. The 3-4 times higher blood flow velocity in the ductus venosus leads to a color reversal with aliasing.

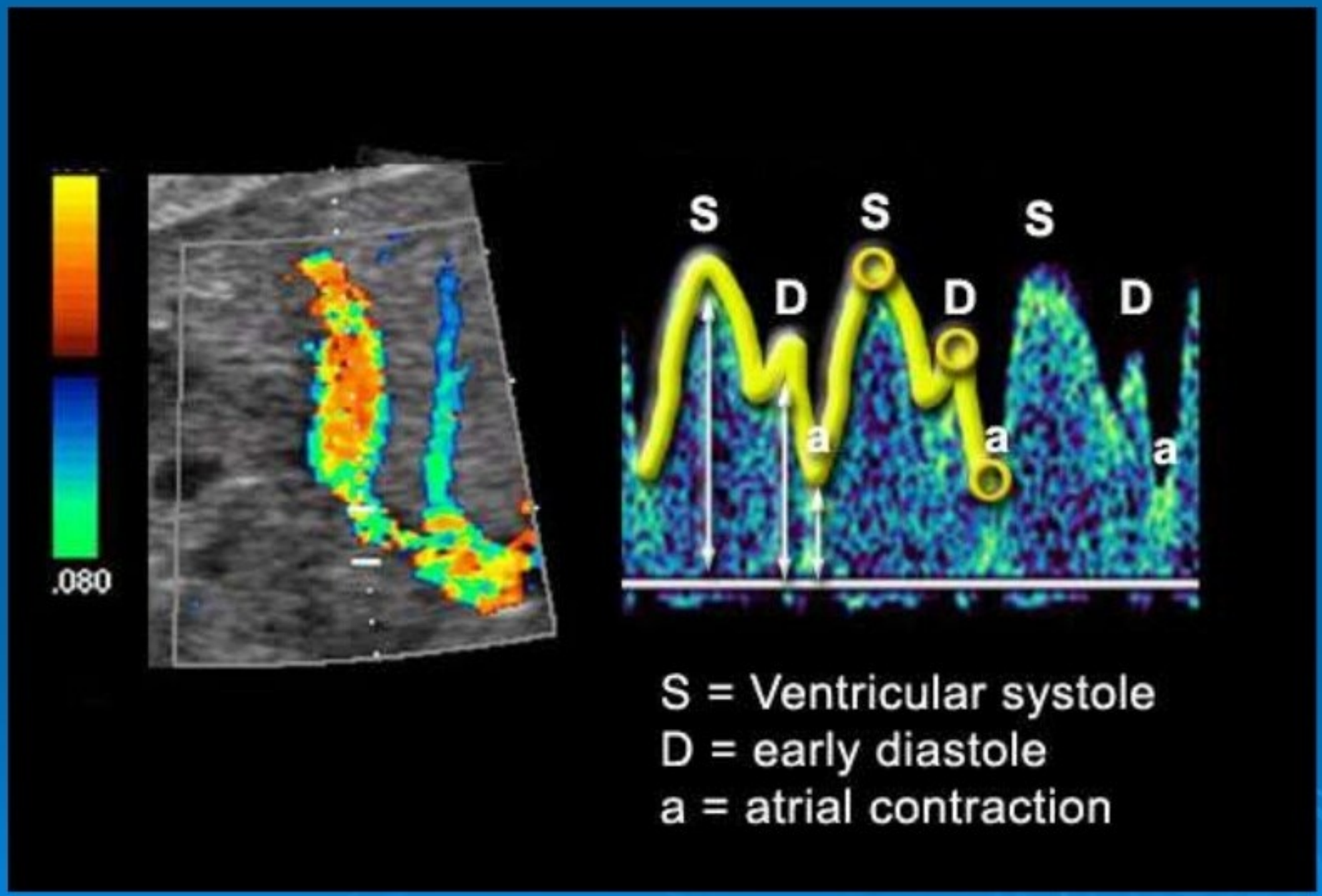
- The spectrum is always sampled at the origin of the ductus venosus,which is the site where the color reversal occurs .
- An insonation angle less than 30° (or 50°) is recommended to obtain an optimum waveform.
- The wall filter should be set as low as possible-between 125Hz and 50 Hz depending on the instrument.

Ductus venosus

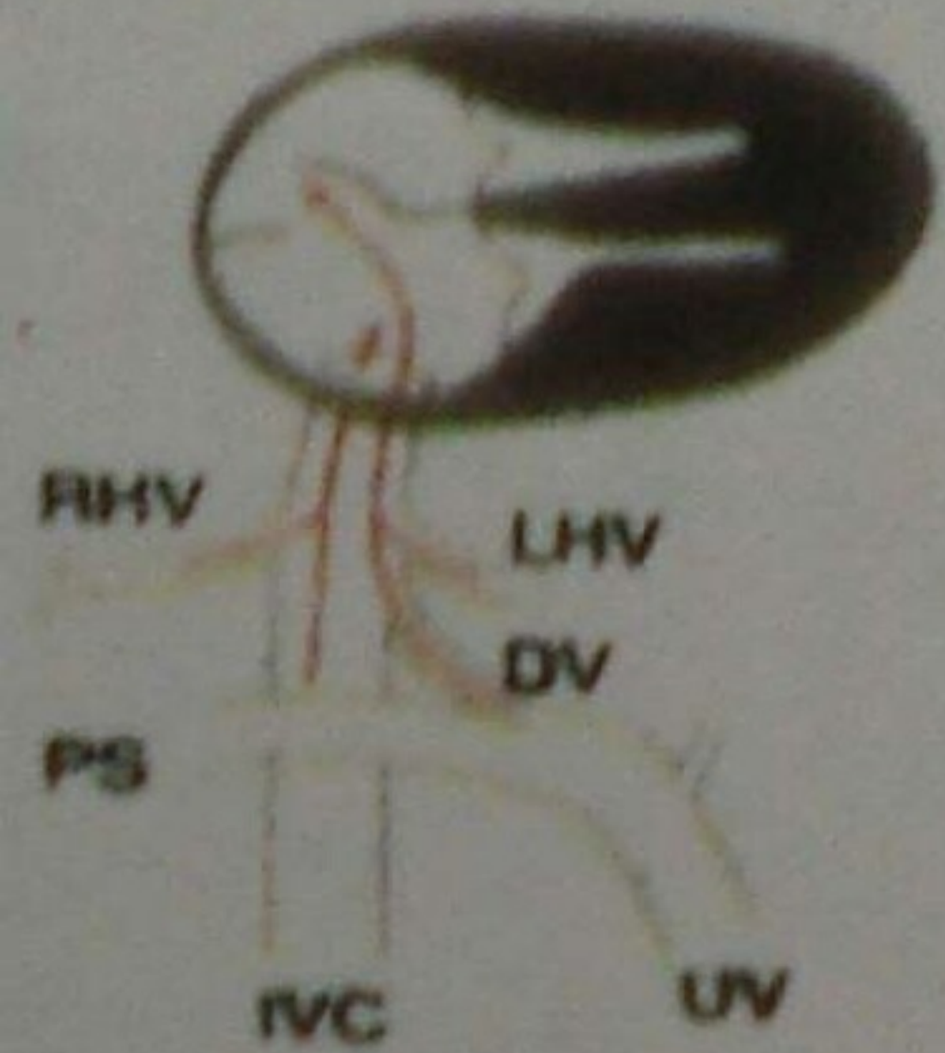


DV SPECTRAL WF:

- ‘M’ Pattern
- High velocity , turbulent, forward flow, envelop never reaches baseline


.080
S
S
S
D
D
D
a
a
a
S = Ventricular systole
D = early diastole
a = atrial contraction

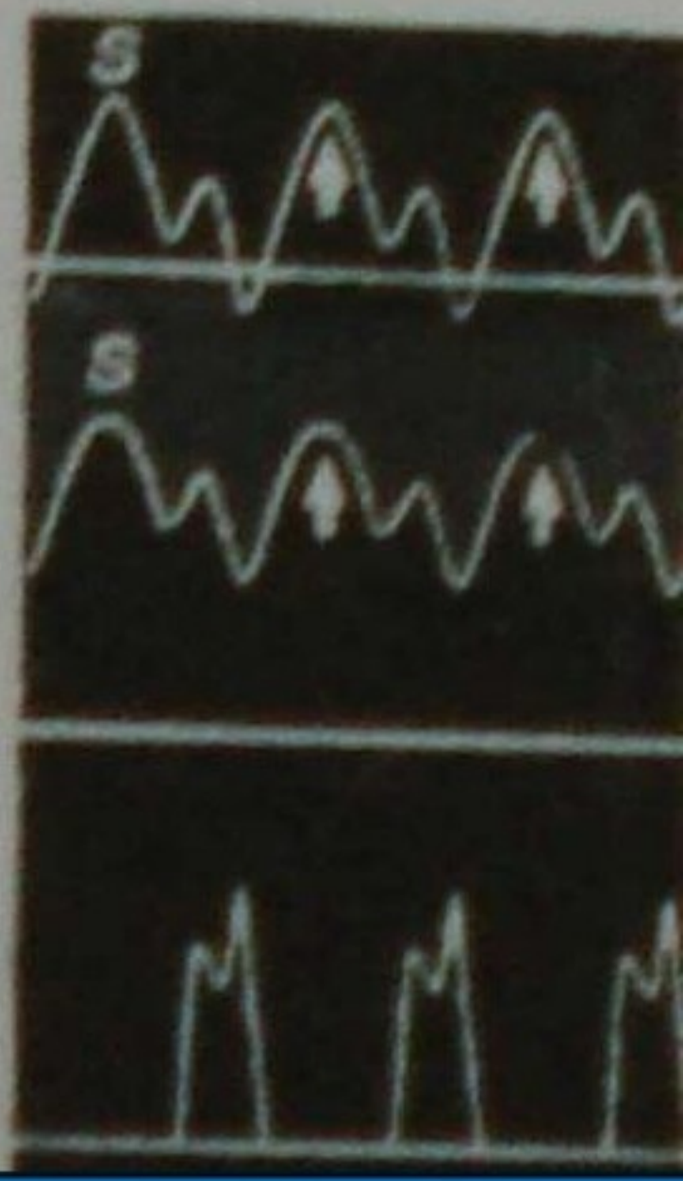
SYSTOLE



HV/IVC

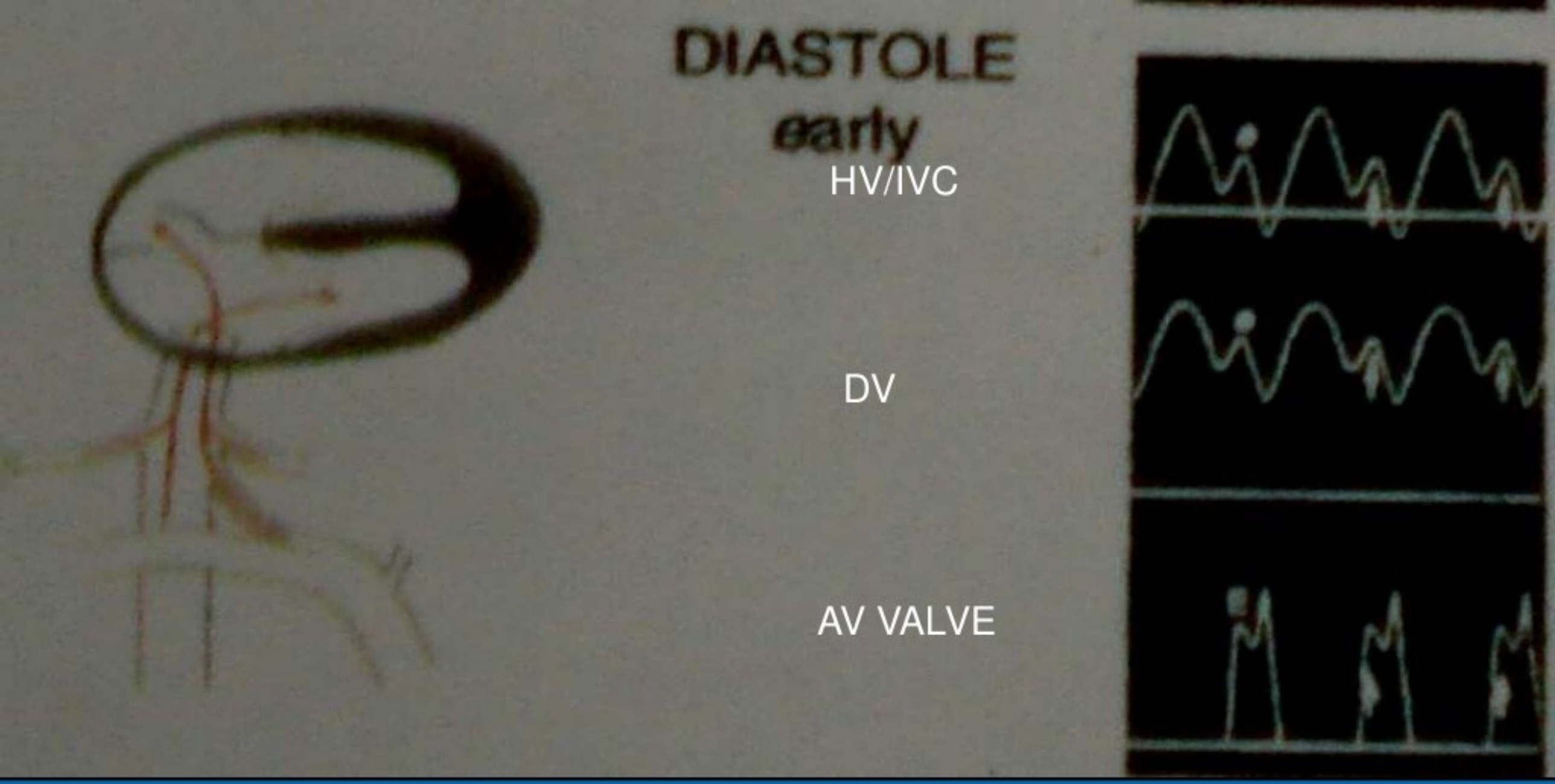
DV

AV VALVE



HIGHEST PRESSURE GRADIENT BETWEEN THE VENOUS VESSELS & THE RA OCCURS DURING VEN. SYSTOLE - HIGHEST FORWARD FLOW

VENTRICLES CONTRACT- AV RING PUULED DOWN- ATRIA DILATE- FORWARD FLOW



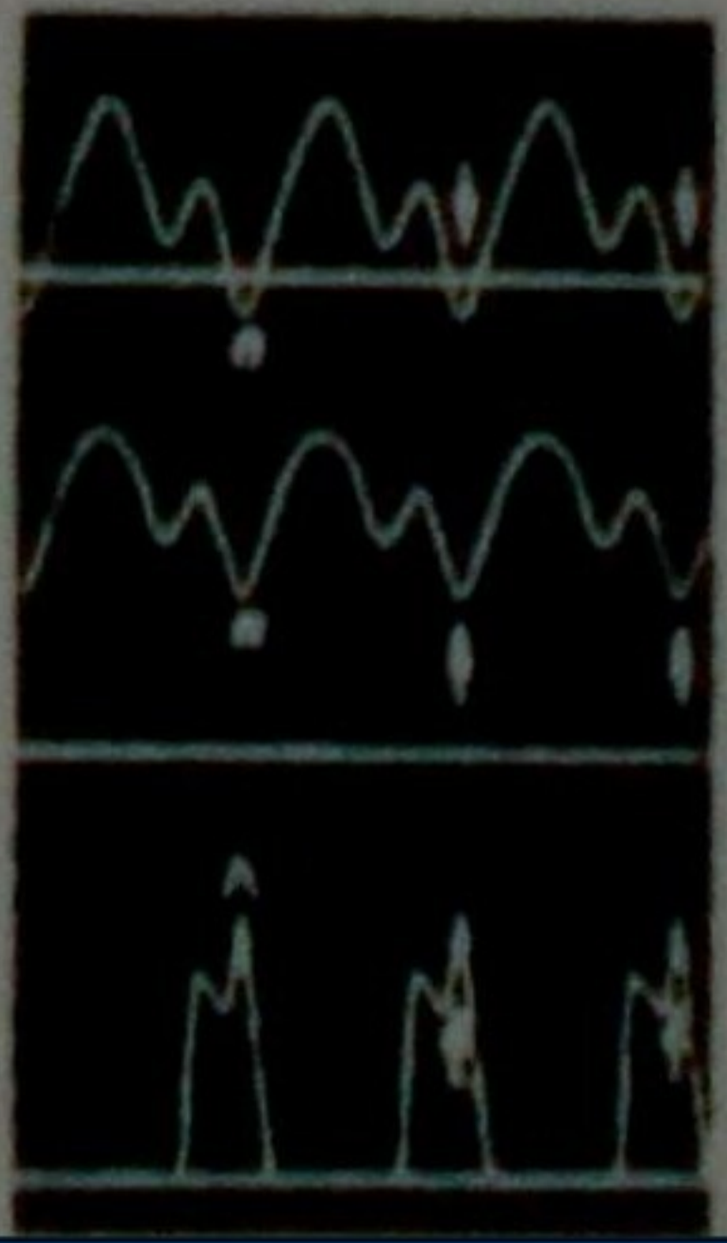
AV FLAPS OPEN – BLOOD GOES FROM A TO V- 2nd FORWARD FLOW

late
(atrial contraction)

HV/IVC

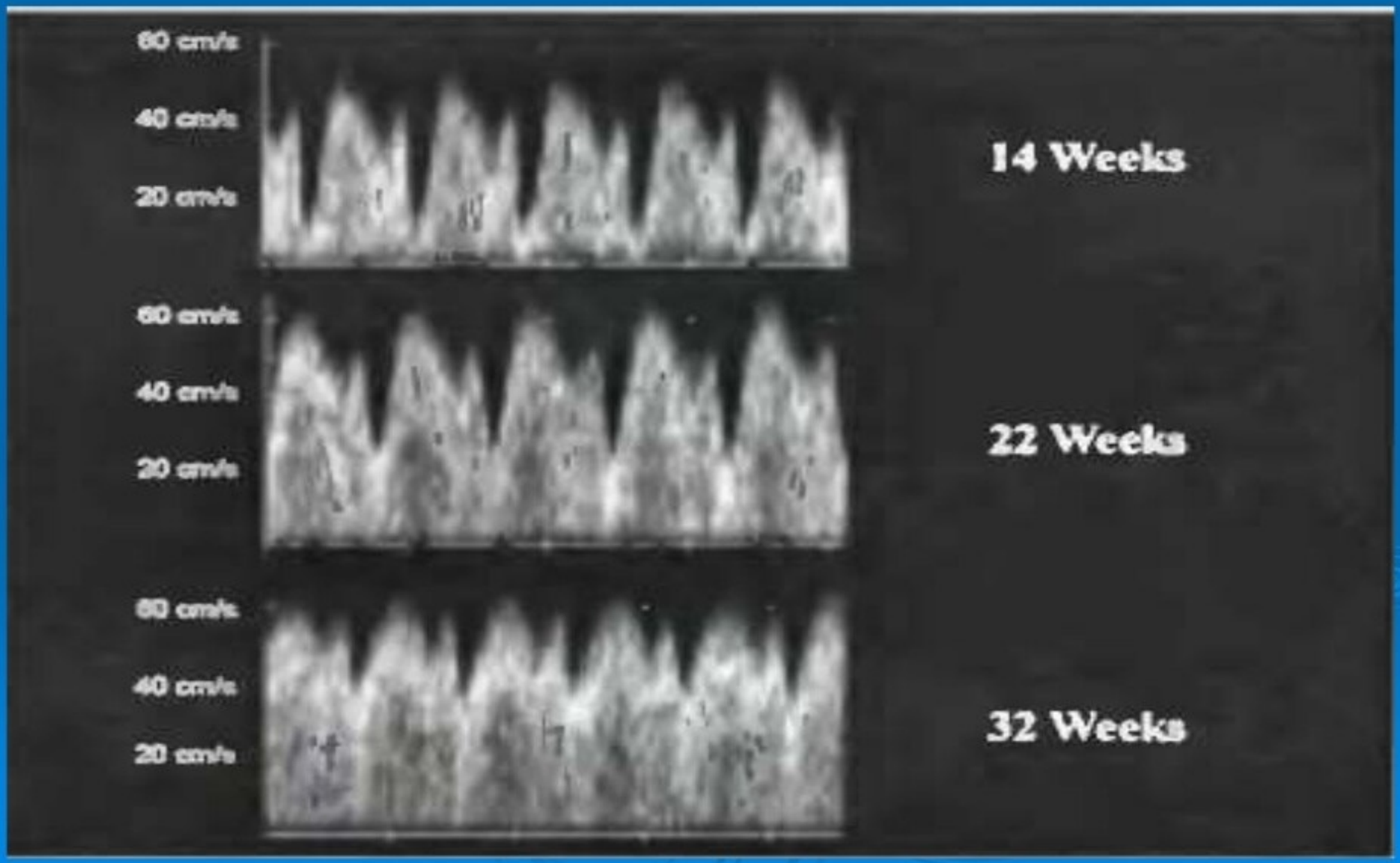
DV

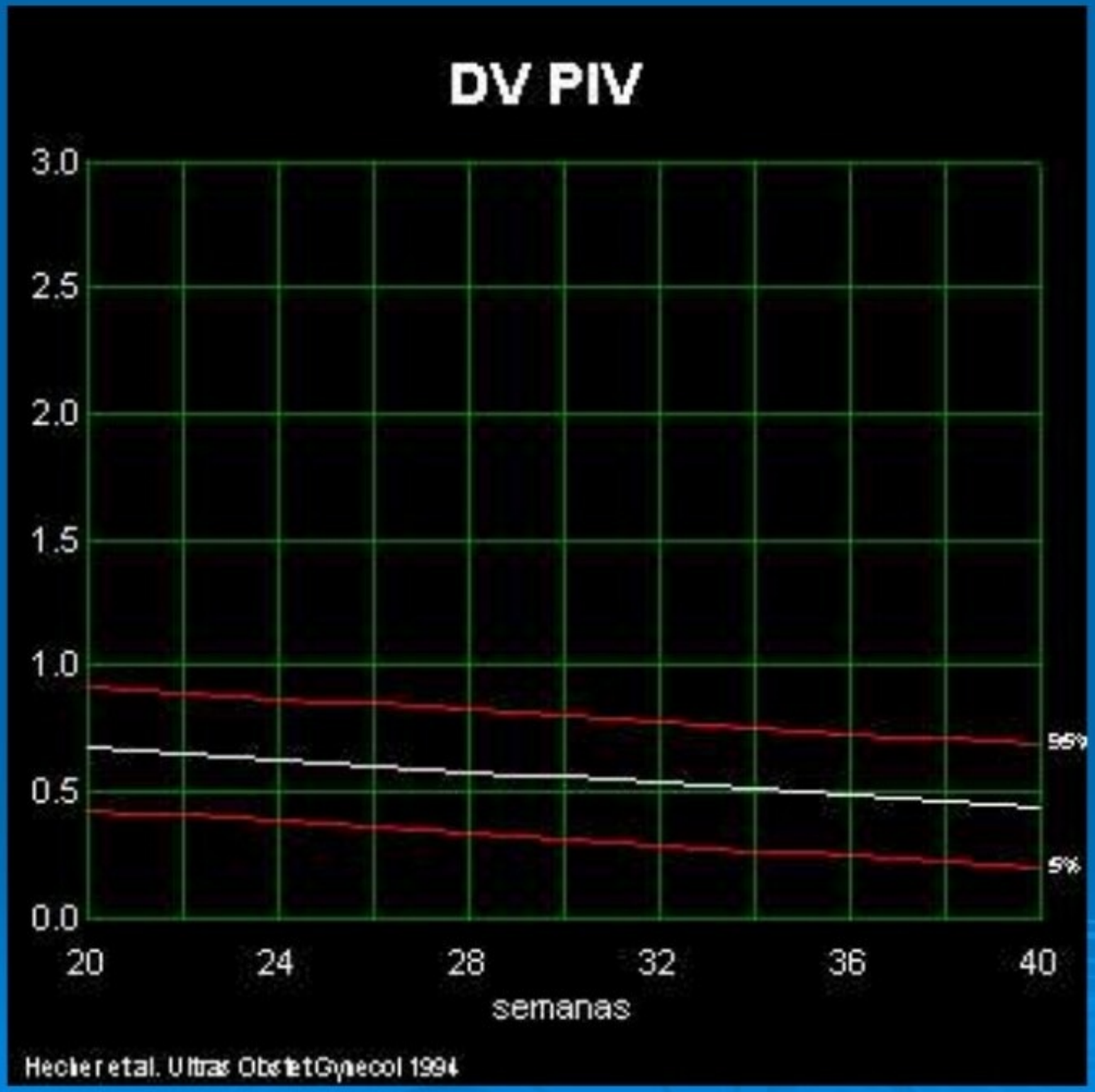
AV VALVE



PASSIVE FILLING OF VENTRICLES DURING ATRIAL CONTRACTION – FORWARD FLOW

Normal ductus venosus spectra as a function of gestational age. With advancing gestational age, the absolute flow velocity increases while pulsatility declines.




DV PIV
3.0
2.5
2.0
1.5
1.0
0.5
0.0
95%
5%
20
24
28
32
36
40
semanas
Hecher et al. Ultras Obstet Gynecol 1994

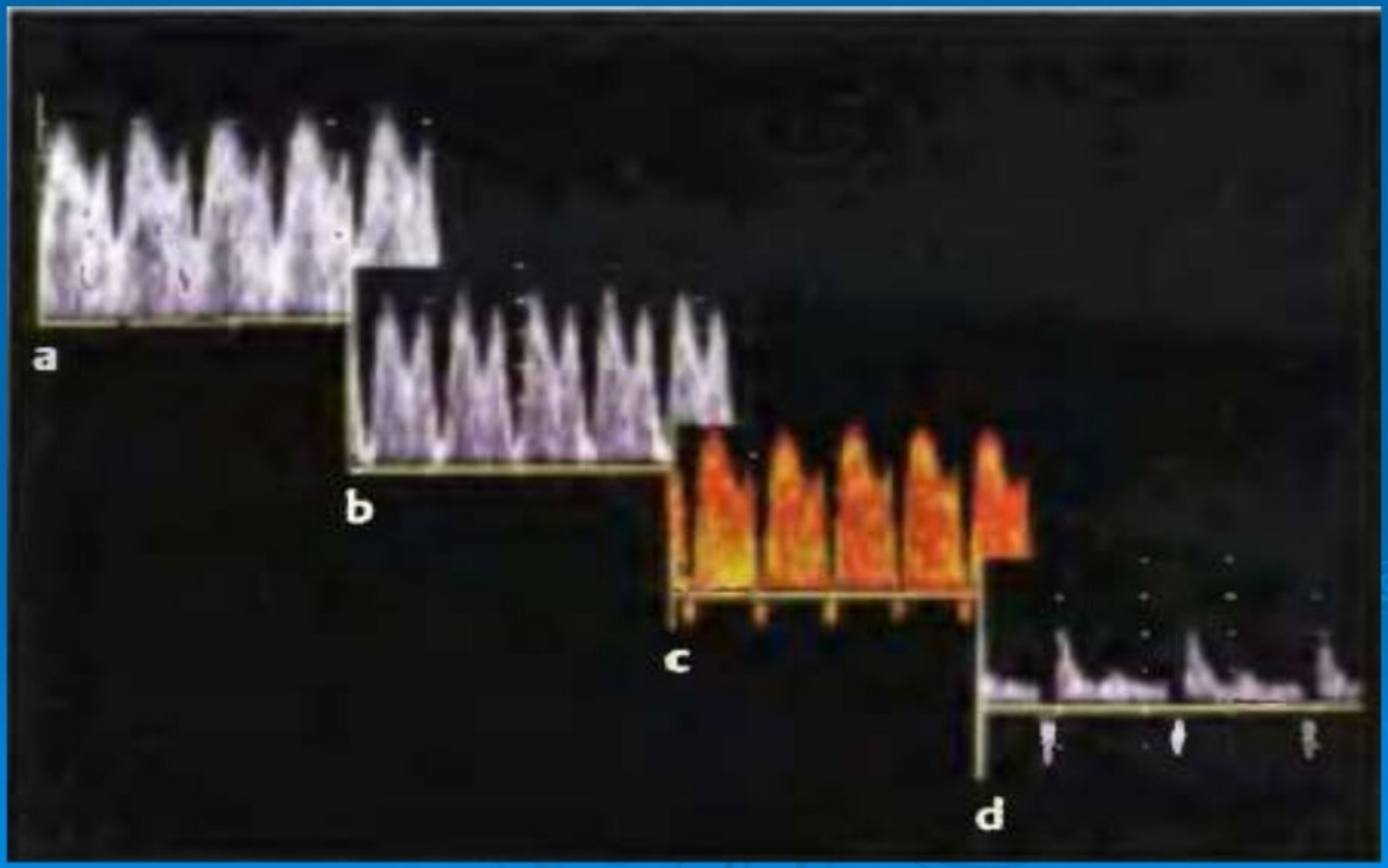
DV – imp. event, forward flow during atrial contraction

- DV is close to heart- it reflects events of rt. atrium
- RA enlarges- ostia of IVC enlarges- RA is full of blood, RA pressure increases than DV pressure – only small amt. of blood goes to RV during atria systole & through IVC blood goes back to DV [reversal of ‘A’ wave]

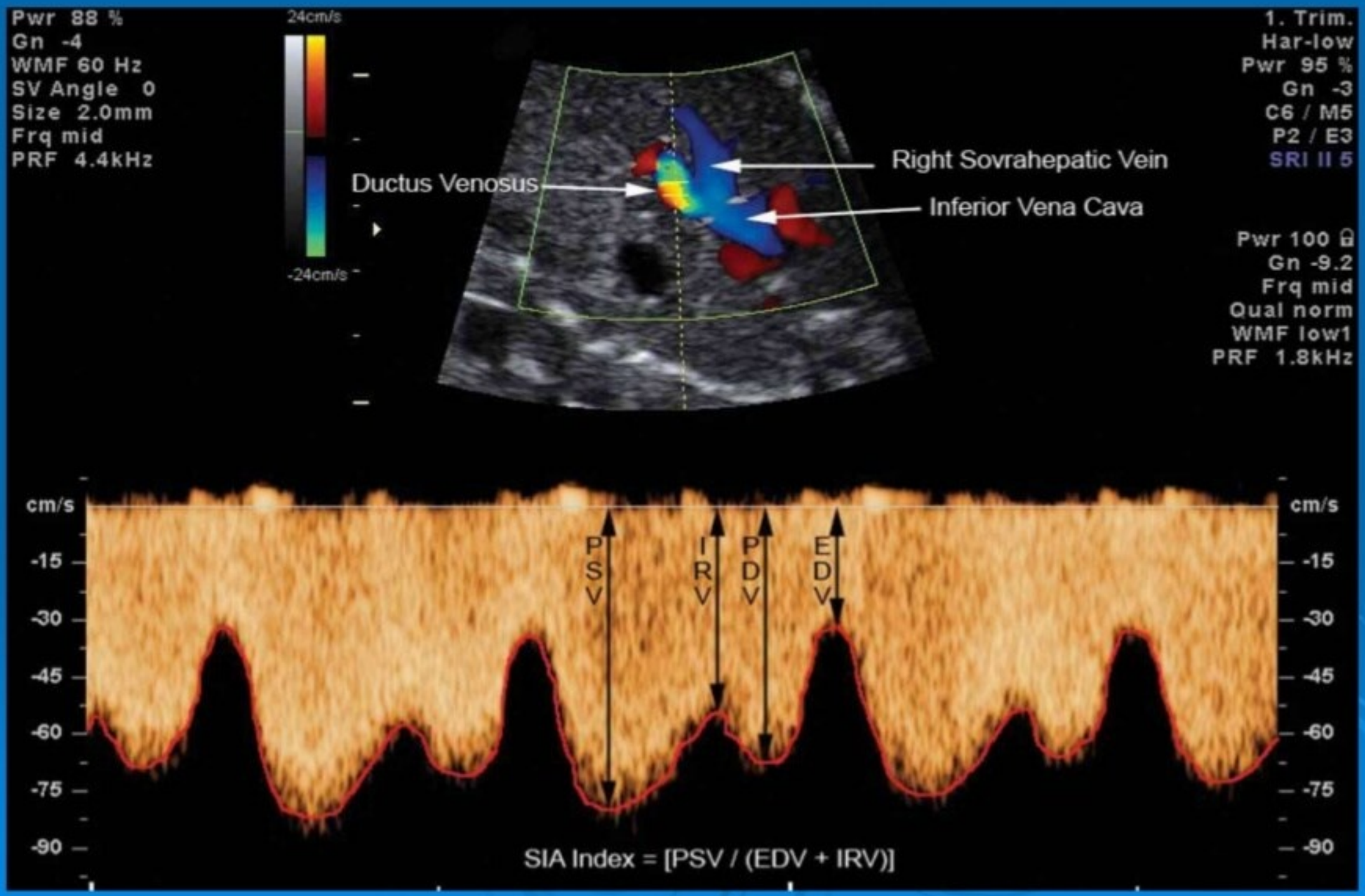
ABNORMAL DV WF

- Normal RV- ventricular muscle- elastic , easily distensible, thin -here narrow DV
- Decreased RV compliance
- Decreased preload – abnormal DV flow
- Myocardium becomes non elastic, compliance decreases, RA has to work hard
- Here DV – wide: reversal of blood flow into IVC & DV

Doppler frequency spectra of the ductus venosus show increasing pathology (a-d) as a result of myocardial insufficiency.



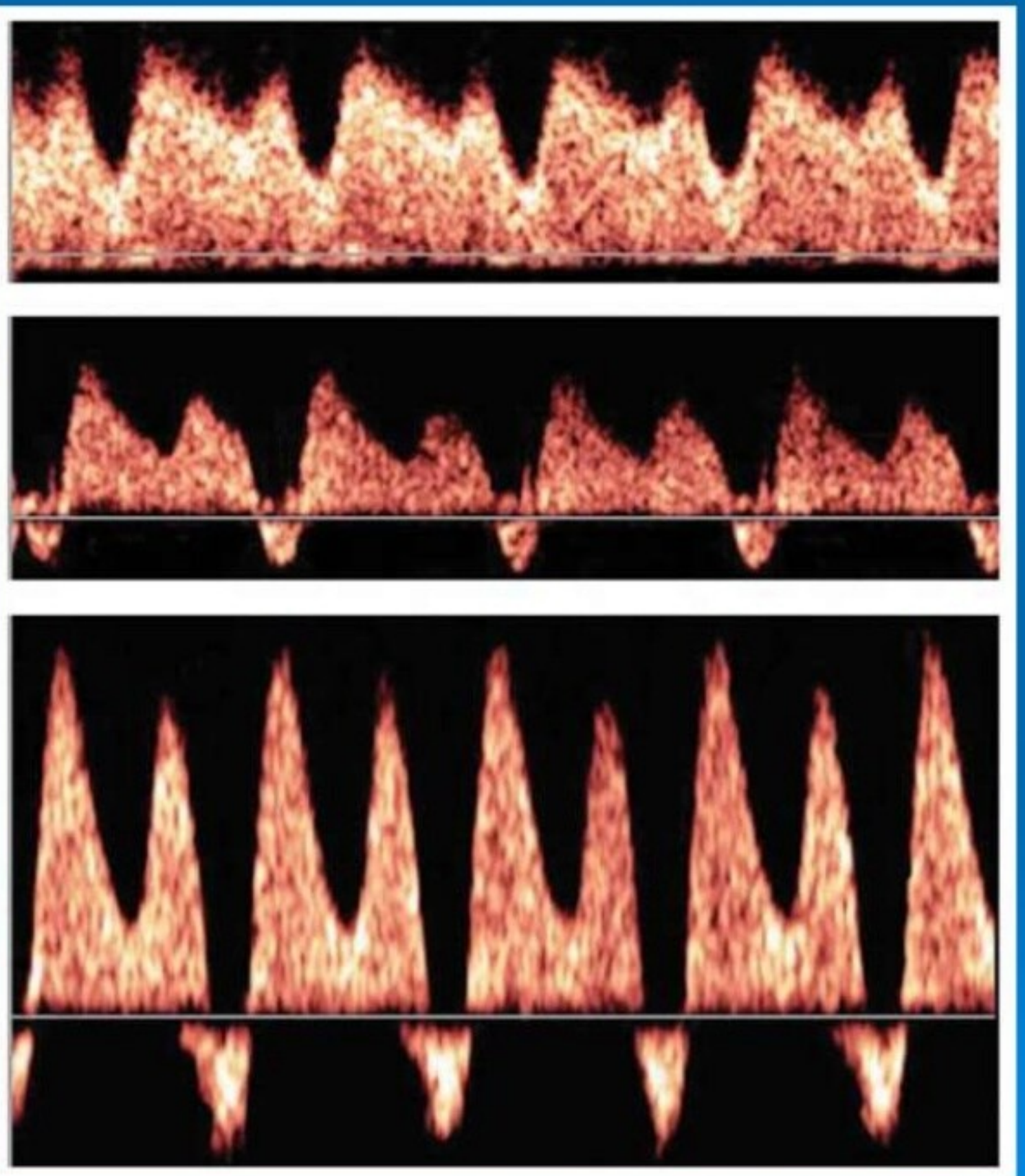
S/A index of DV waveform



- Ductus venosus (DV) Doppler waveforms show 2 periods of decreased velocity during isovolumetric relaxation (isovolumetric relaxation velocity [IRV]) and atrial contraction (A wave or end-diastolic velocity [EDV]).

- The S-wave/isovolumetric A-wave (S/A index) for each fetus was compared to fetal/neonatal outcomes.

$$(S/A)\ \text{index} = PSV/(IRV + EDV)$$

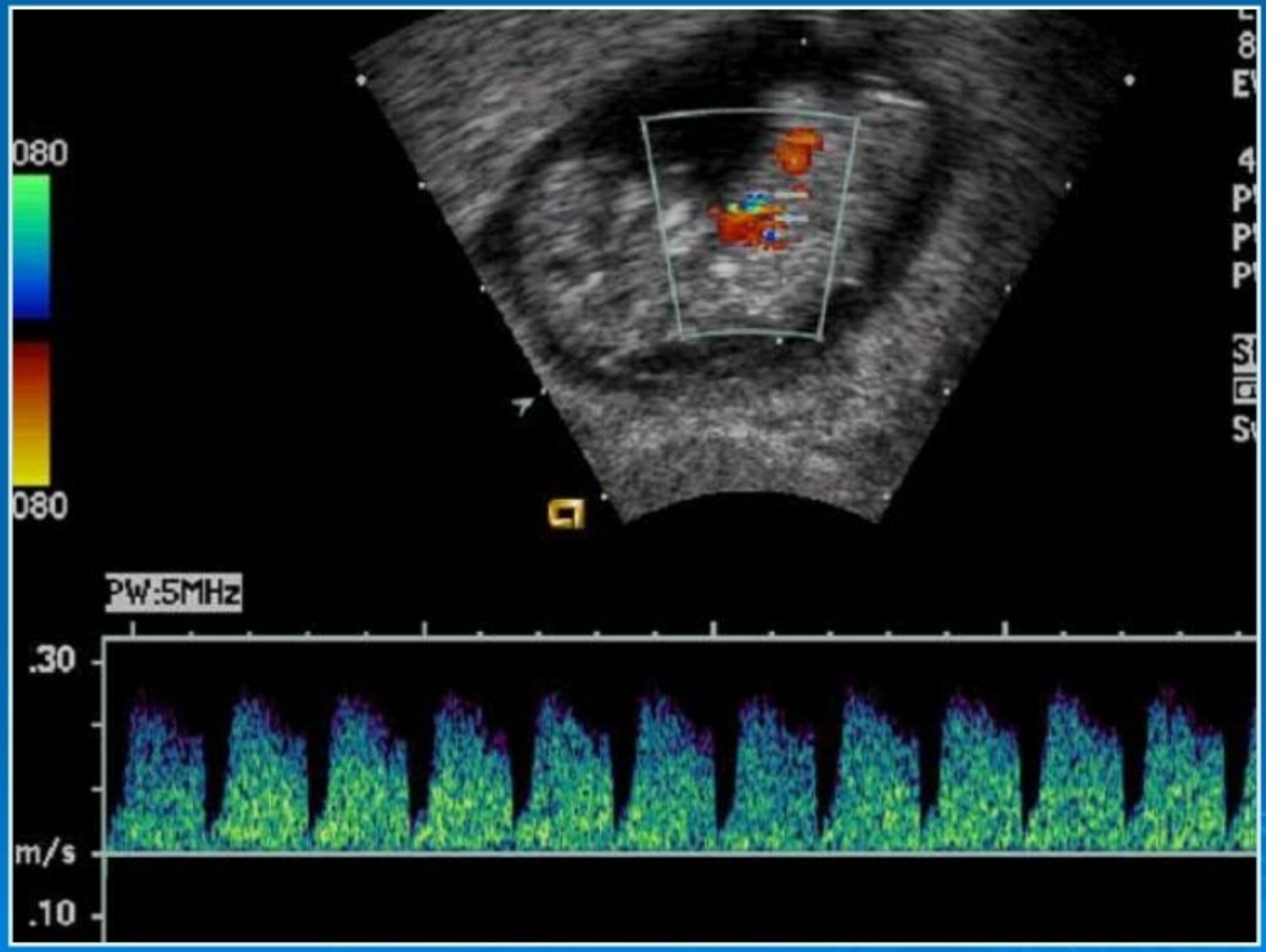


Flow velocity waveforms of the DV in an IUGR fetus at
13 days (**A**),
7 days (**B**),
48 hours (**C**) before intrauterine death at 25 weeks' gestation

ABNORMAL DV

- SICK FETUS– IUGR ,FETAL ANEMIA →cardiac decompensation & acidemia
- 1st TRIMESTER – CHROMOSOMAL ANOMALY
- CARDIOMYOPATHY, VIRAL MYOCARDITIS
- TACHYARRYTHMIA
- CONG. CARDIAC ANAMOLY- ebstein s anomaly
- TTS
- CARDIAC FAILURE DUE TO AV MALFORMATION [VEIN OF GALEN ANEURYSM, LARGE HAEMANGIOMA,CHORIOANGIOMA OF PLACENTA
- ANATOMICALY ABSENT DV

DV: [1st trimester]



- Abnormal blood flow demonstrated as reversed a wave in the ductus venosus is seen in 80 % of fetuses with trisomy 18 and 5 % of euploid fetuses.

CAUTION:

- DV sampling in 1st trimester is only indicated if NT is abnormal
- DV sampling in IUGR fetus is indicated if umbilical, MCA or both are abnormal
- Loss of ‘M’ pattern is observed when there is excessive fetal movement, breathing movement, post prandial state, with hyperdynemic circulation

IVC Doppler

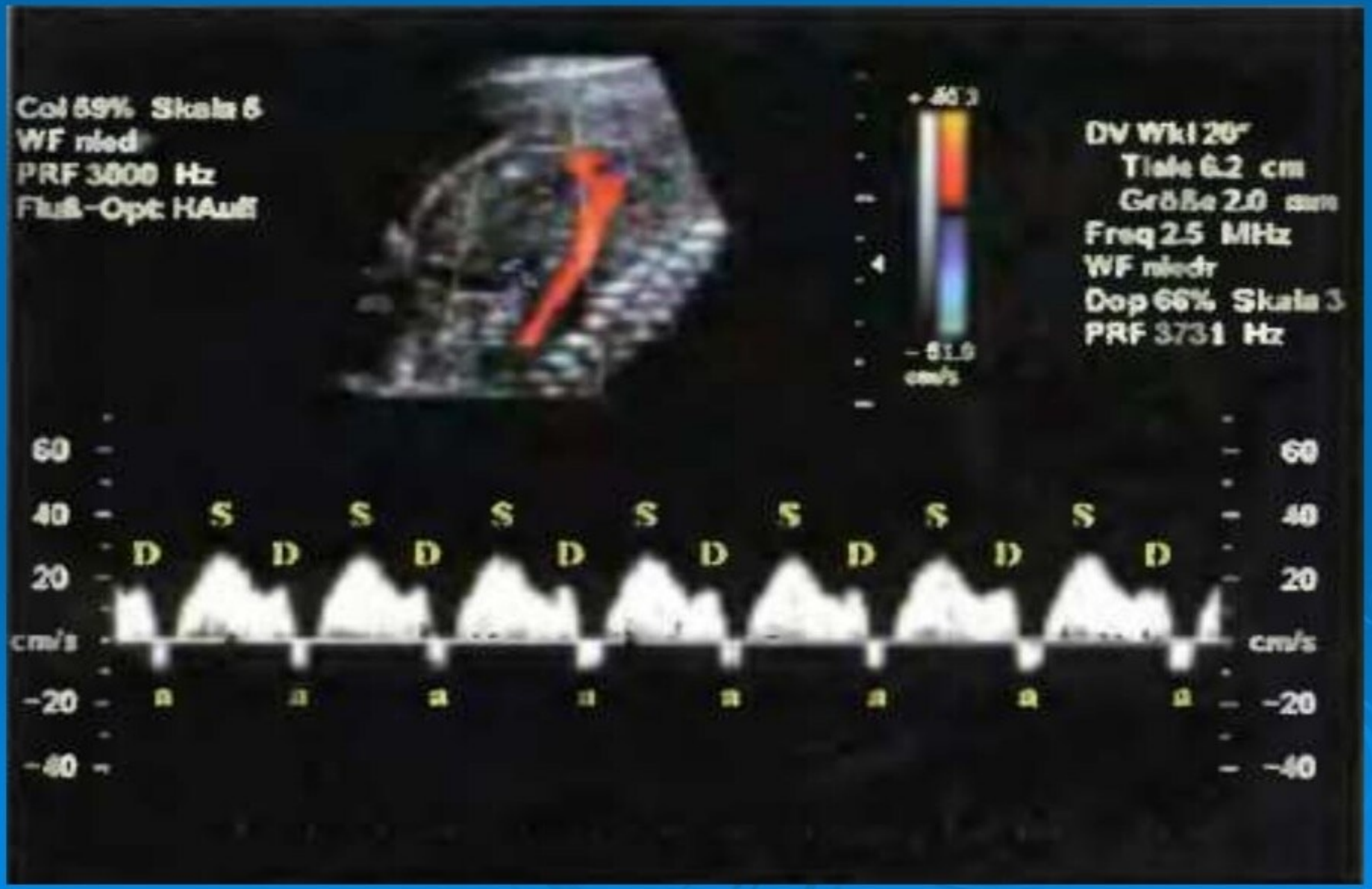
- They found that recording the Doppler spectrum between the renal vessels and the subdiaphragmatic hepatic veins or below the ductus venosus provided the best reproducibility,the most favorable beam-vessel angle, and the least variation.
- At this site the inferior vena cava is scanned in a longitudinal parasagittal plane at a low insonation angle (< 30°).

Interpreting the frequency spectrum.

- As in the ductus venosus, the waveform of the inferior vena cava reflects the systolic and diastolic phases of the cardiac cycle and therefore reflects the intracardiac pressures.

- Unlike the ductus venosus. the inferior vena cava waveform exhibits a bidirectional, triphasic flow pattern with a retrograde component during atrial contraction. Additionally, the flow velocities in the inferior vena cava are one-half to one-third the velocities in the ductus venosus

Normal Doppler frequency spectrum recorded from the inferior vena cava

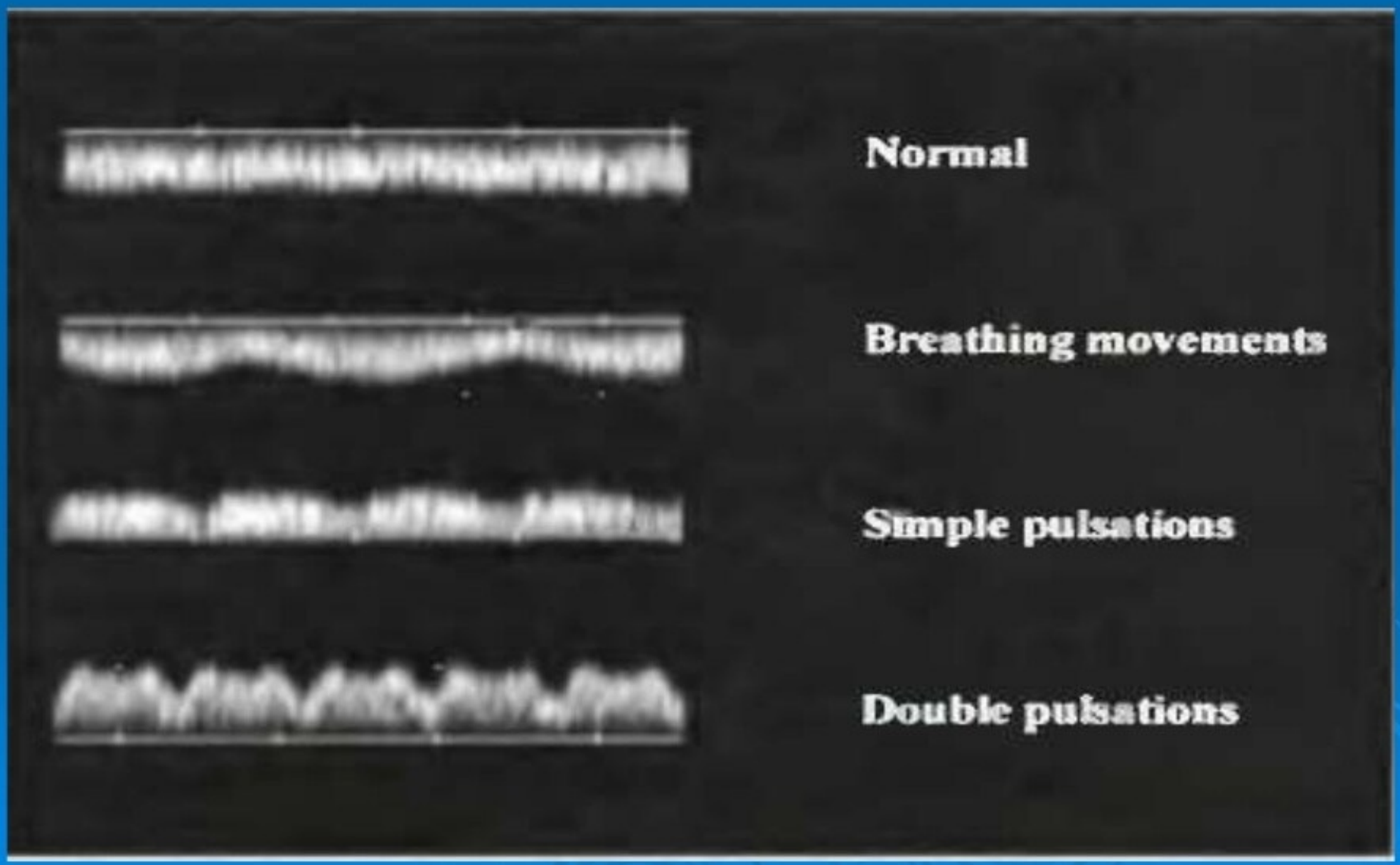


- In healthy fetuses, significant decrease of the reversed flow during atrial contraction is seen with the advancing gestation.
- These are due to improved ventricular compliance and due to reduction in the right ventricular afterload caused by the fall in placental resistance as the pregnancy advances.
- In IUGR fetuses the IVC is characterized by increase in reversed flow during atrial contraction.
- This increase is due to abnormal ventricular filling characteristics, an abnormal ventricle chamber,or wall compliance.

Umbilical vein doppler

- The umbilical vein waveform generally shows a monophasic pattern with a mean flow velocity of 10-15 cm/s.
- The presence of umbilical vein pulsations in the second or third trimester may signify a cardiac anomaly, arrhythmia, or congestive heart disease.
- Pulsations in the umbilical vein may occur as single or double pulsations or may produce a triphasic Doppler spectrum.
- A markedly increased mortality rate of 50-60% is reported in cases where these flow patterns are detected.

Doppler frequency spectra of the umbilical vein in various fetal states.



Summary of venous doppler

- Venous Doppler also reflects cardiovascular response to increased placental resistance
- Increased cardiac work required to perfuse abnormally resistive placenta
- Right ventricle is the fetal systemic ventricle
- RV decompensation ~ tricuspid regurgitation
- Tricuspid regurgitation ~ increased right atrial pressure
- Increased right atrial pressure transmitted to venous structures
- Inferior vena cava (IVC)
- Normal cyclical waveform reflects cardiac cycle
- Increased right atrial pressure ~ increased retrograde flow in IVC

DV

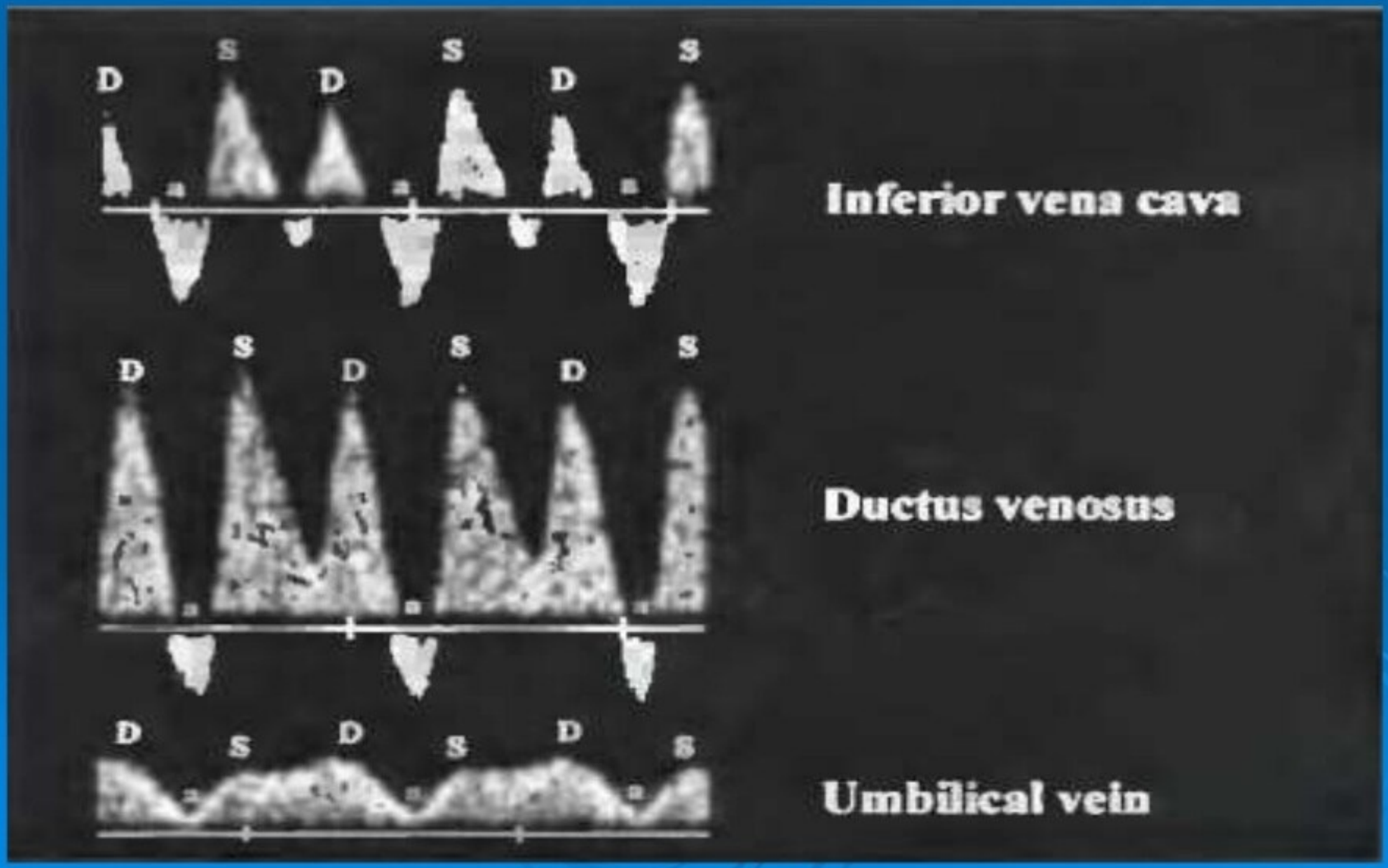
- With further decompensation retrograde flow occurs during atrial contraction

UV

- Normal flow is continuous, forward, non-pulsatile
- Regular pulse at end-diastole reflects elevated right heart pressure
- Increased Right heart pressure transmitted to

  IVC -> DV ->UV
- Pulsations not timed to end-diastole likely relate to fetal breathing activity
- Tracing will normalize when breathing stops
- Pulsatile UV flow signifies advanced cardiac decompensation

Very abnormal Doppler spectra recorded from the inferior vena cava, ductus venosus, and umbilical vein of a fetus with severe intrauterine growth retardation (28 weeks, 5 days). The spectra are temporally aligned for comparison. The hypoxemic myocardial~nsufficiency causes an increase in right atrial pressure during atrial contraction (- a). This is reflected in an increased retrograde component in the inferior vena cava. a reverse flow component in the ductus venosus. and a twin-peak pulsation pattern with a deep second notch in the umbilical vein.

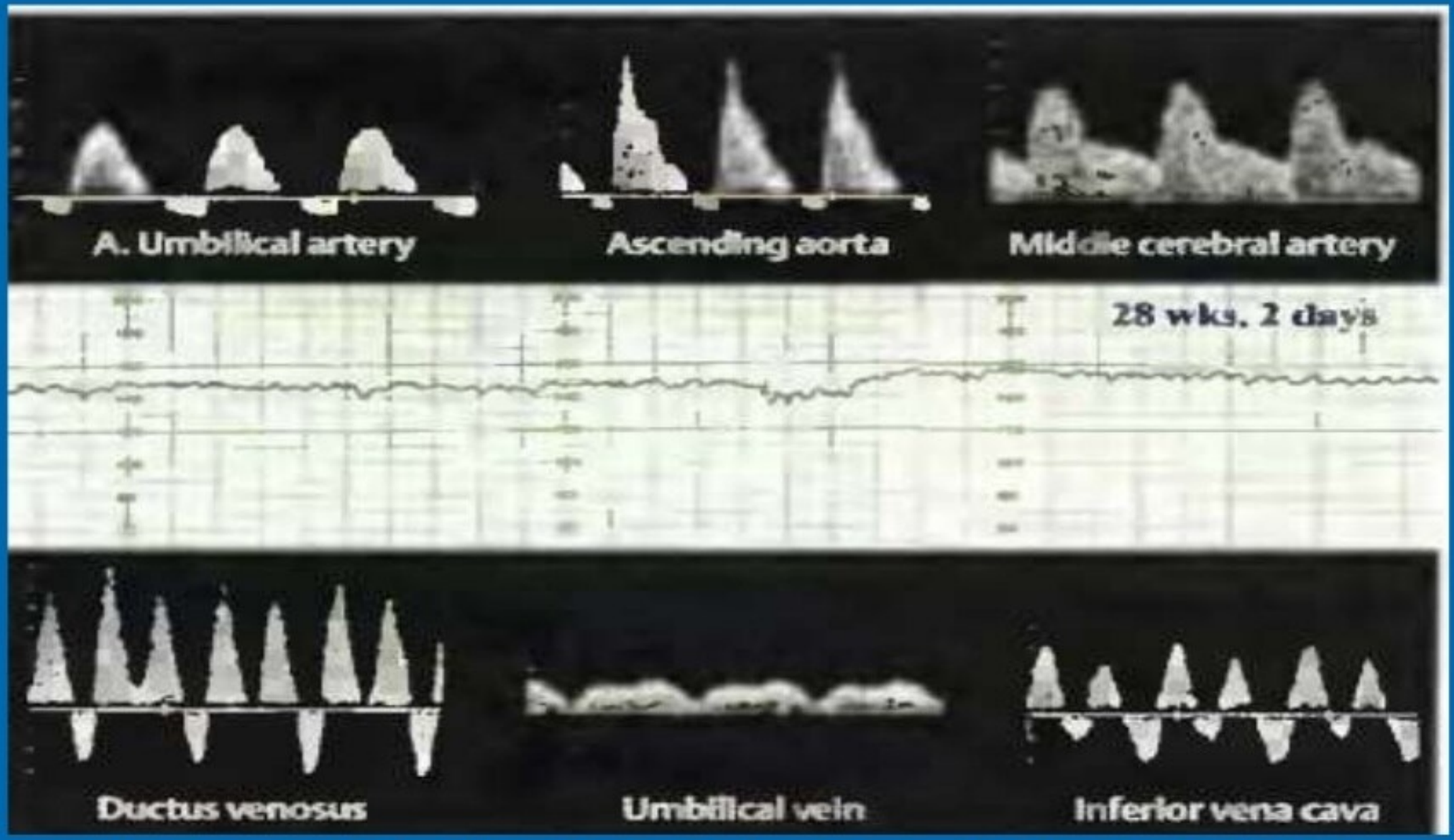


Role of venous doppler

- Venous Doppler scanning is mainly indicated in cases that have shown absent or reverse end-diastolic flow in the umbilical artery .

- The goal of venous Doppler in these cases is to provide additional , noninvasive information on the functional capacity of the fetal heart to help determine the optimum timing of the delivery.

- This is particularly important before 30 weeks' gestation in severely growth retarded fetuses in a setting of chronic placental insufficiency. The essential goal in these cases is to prolong the pregnancy by at least 1-2 days to allow for therapy to accelerate fetal lung maturation.

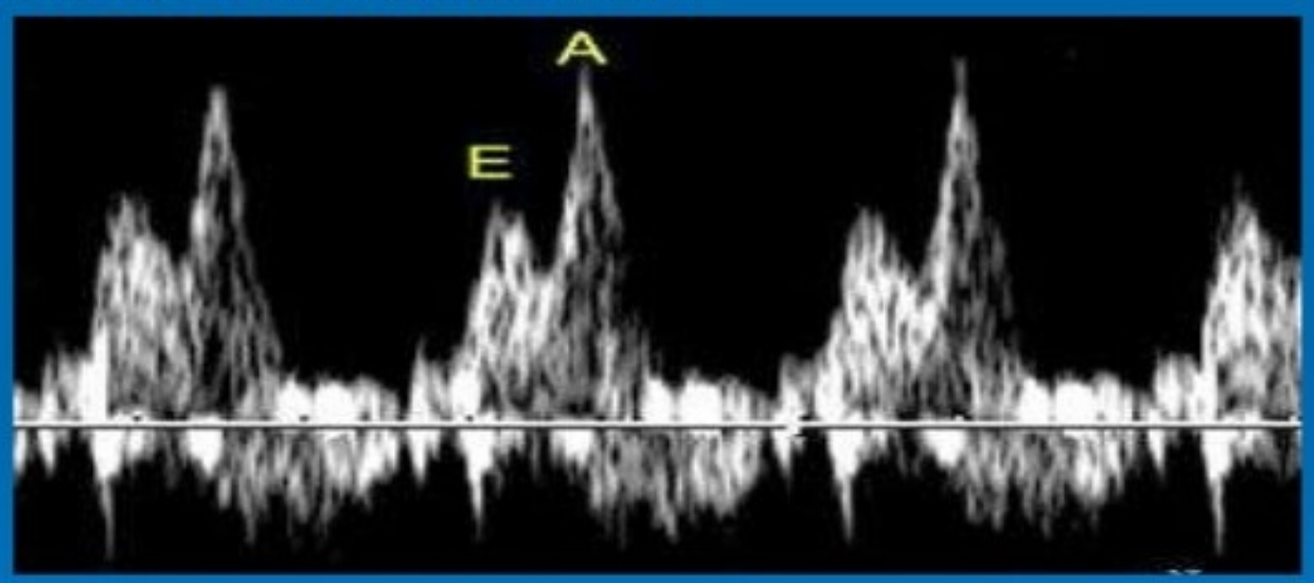


FHR recording compared with arterial and venous Doppler spectra from a growth-retarded fetus at 28 weeks. 2 days. The spectra indicate reverse flow in the umbilical artery and descending aorta with a brain-sparing effect in the middle cerebral artery.
The venous system also shows a very abnormal Doppler frequency pattern.The ductus venosus shows high pulsatility with a retrograde component during atrial contraction. The other spectra show double pulsations in the umbilical vein and an increased retrograde component in the inferior vena cava during atrial contraction. The FHR recording is abnormal, showing decreased variability and slight deceleration

FETAL CARDIAC DOPPLER

- Several planes Including the abdominal view, four-chamber, five-chamber, short-axis and three-vessel views have to be assessed.
- When adding color Doppler to your grayscale image, select high-velocity scales given that the velocity of cardiac blood flow is higher than the peripheral fetal circulation.
- By adjusting your filters to a high setting and by directing the angle of insonation of your ultrasound beam parallel to the direction of blood flow, the color Doppler image is optimized and wall motion artifact is significantly reduced.
- The insonating angle should be within 15 to 20 degrees of the direction of blood flow, Doppler waveforms should be obtained during fetal apnea, and multiple measurements should be made.

- The fetal circulation is in parallel rather than in series, and the right ventricular cardiac output is greater than the left ventricular cardiac output
- Doppler waveforms across the atrioventricular valves are bicuspid in shape .
- The first peak (E wave),corresponds to early ventricular filling of diastole, and the second peak (A wave) corresponds to atrial systole or the atrial kick.



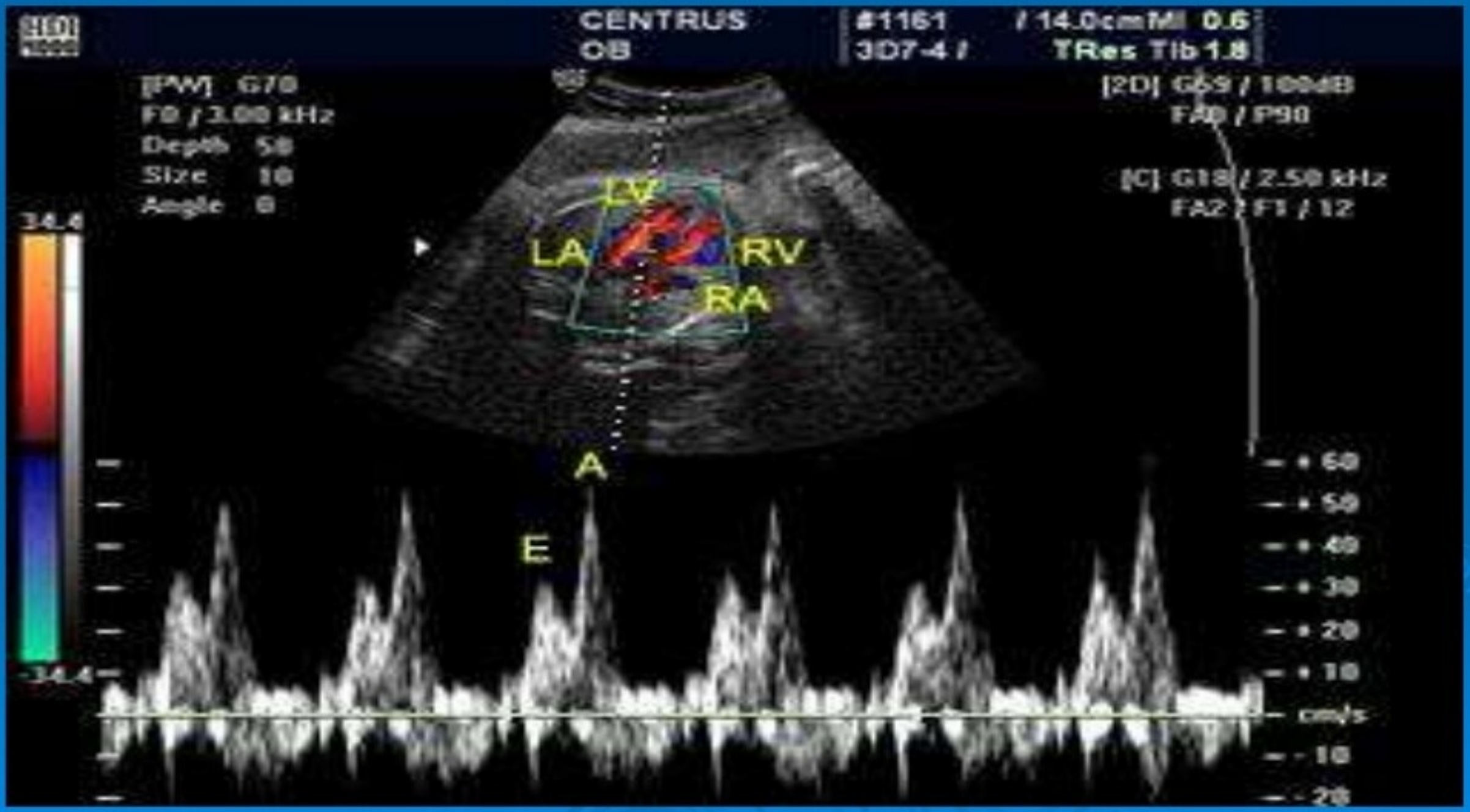
- Unlike in postnatal life, the velocity of the A wave is higher than that of the E wave in the fetus.This highlights the importance of the role that atrial systole plays in cardiac filling in fetus.

- The E/A ratio increases and approaches near 1 with advancing gestation and reflects ventricular diastolic function,suggesting that atrial systole becomes less important with maturation of ventricle myocardium.

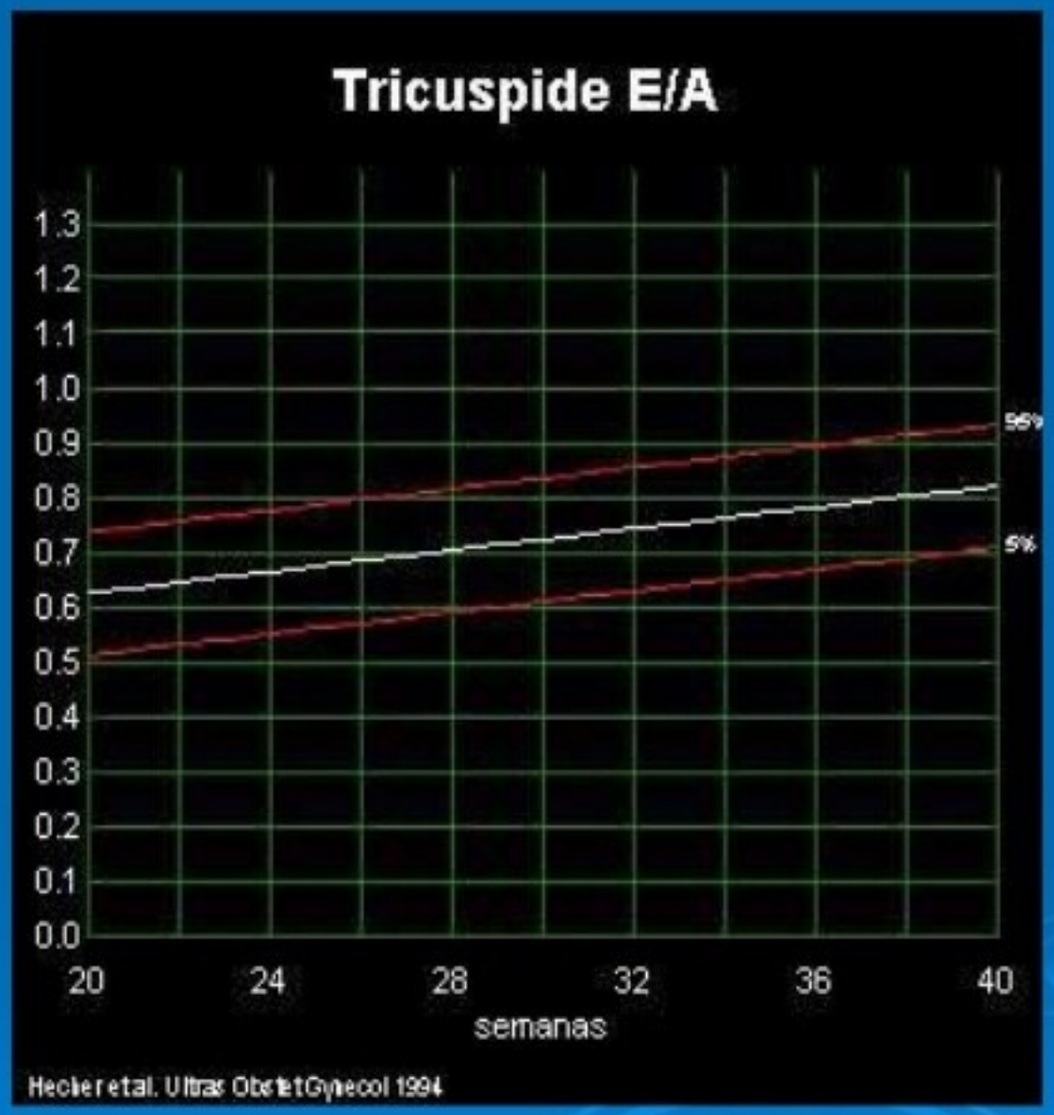
- E and A velocity peaks are higher in the right ventricle, and this right ventricular dominance is noted from the first trimester.

- Shifting to left ventricular dominance starts in utero toward the end of gestation.The E/A ratio is an index of ventricular preload and compliance

Flow velocity waveform at tricuspid valve at 28 wks gestation



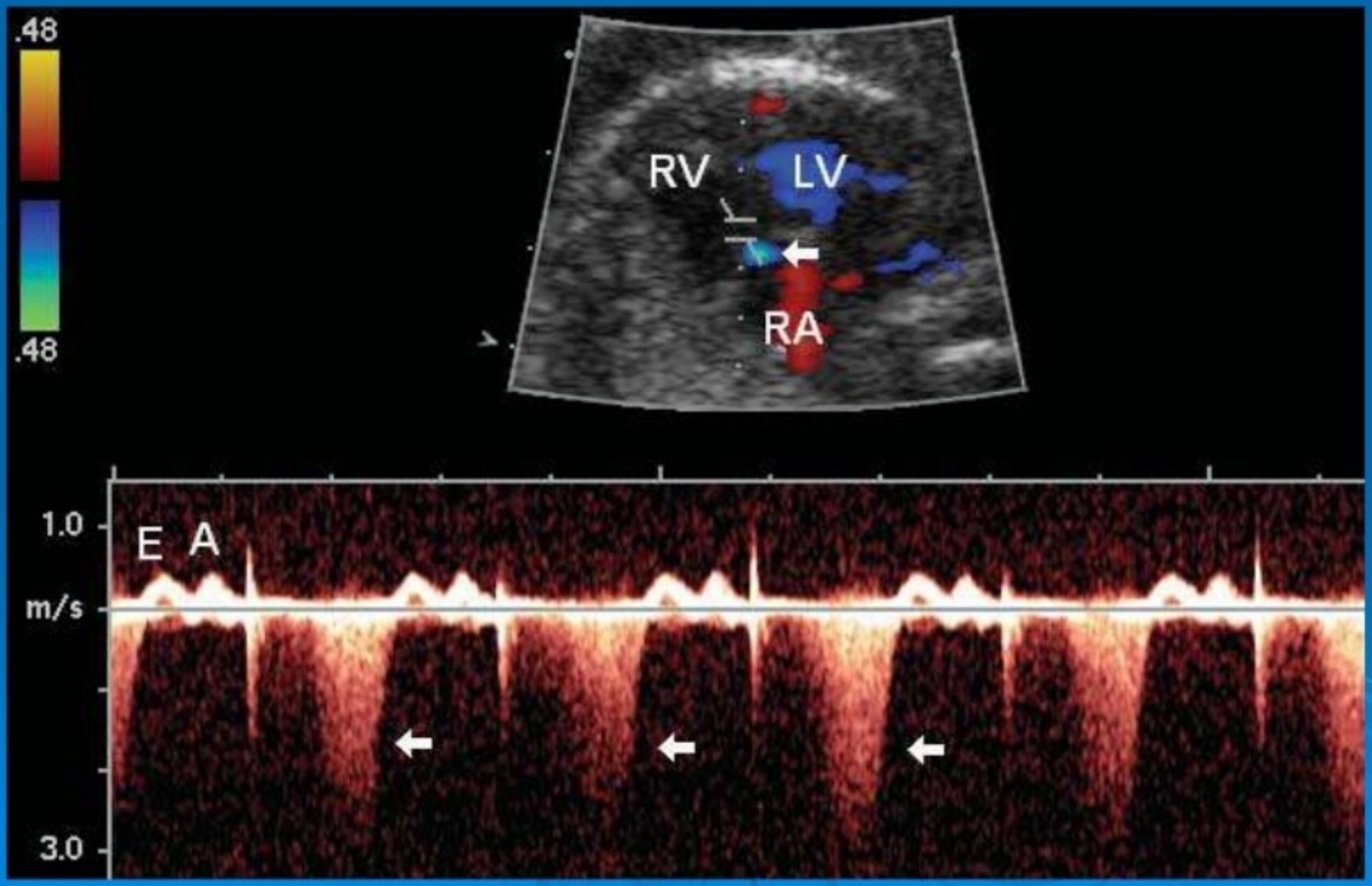
Normograph



- This E/A ratio increases during pregnancy to 1 ,reversed after birth.

- The ratio between the E and A waves (E/A) is a widely accepted index of ventricular diastolic function and is an expression of both the cardiac compliance and preload conditions
- In IUGR fetuses,the E/A ratio is higher than that of normal fetuses,due to changes in preload without impairment of fetal myocardium diastolic function (Increased preload causes decreased ‘A’ wave,thereby increasing E/A ratio).
- In most severe cases there is mitral and tricuspid regurgitation.

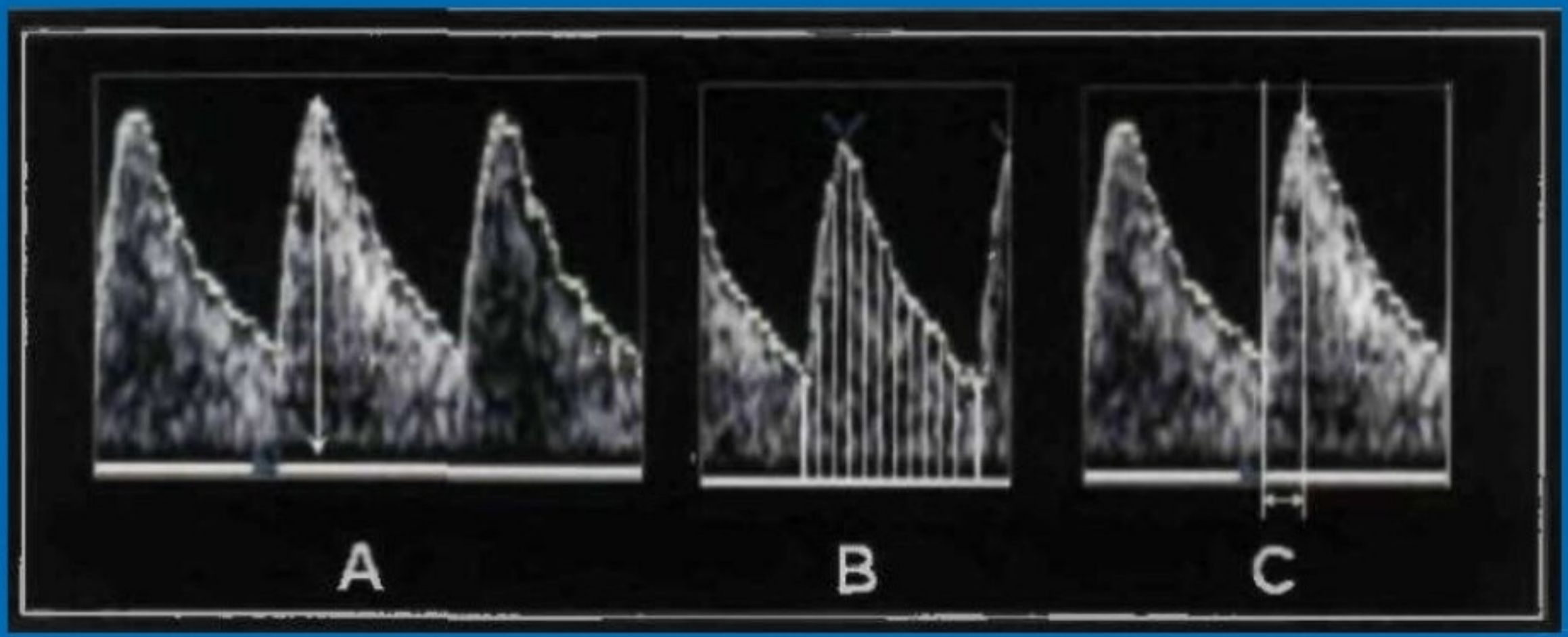
Tricuspid regurgitation evidenced by color Doppler ultrasonography (arrow). The pulsed Doppler image shows the TV waveforms above the baseline, with the E and A waveforms, and olosystolic regurgitation (arrows) below the baseline



- Doppler waveforms across the semilunar valves are uniphasic in shape
- Indices most commonly used for the semilunar Doppler waveforms include the peak systolic velocity (PSV) and the time to peak velocity (TPV).
- PSV and TPV increase with advancing gestation across the semilunar valves.
- PSV is higher across the aorta than across the pulmonary artery owing to a decreased afterload and a smaller diameter across the aorta.
- These Doppler indices reflect ventricular contractility,arterial pressures, and afterloads

Doppler waveform across aortic valve flow velocity waveforms from the aorta and pulmonary arteries are recorded respectively from the five-chamber and short-axis views of the fetal heart

Doppler indices that are commonly used in fetal echocardiography



A, Peak-systolic velocity PV

B, time velocity integral TVI

C, time-to peak velocity TPV

Measurement of cardiac output and ventricular ejection fraction(VEF)

- Formula for cardiac output is

Q = TVI x HR x A

Q=absolute flow per minute, A=area of the valve,HR=heart rate

TVI=time velocity integral is a measure of length of the column of blood.

- VEF is calculated according to Newton's second law of motion i.e the force as the product of mass and acceleration

VEF = (1.055.'valve area' .FVI AT)

- FVI AT is PV/TPV
- The mass in this model is the mass of blood accelerated into the outflow tract over a time interval, and may be calculated as the product of the density of blood (1.055),the valve area and the flow velocity time integral during acceleration (FVI AT), which is the area under the Doppler spectrum envelope up to the time of peak velocity.

- IUGR is associated with several changes at the level of the fetal heart involving preload, afterload, ventricular compliance, and myocardial contractility.

- These arterial Doppler abnormalities are followed by abnormalities in

right cardiac diastolic indices

right cardiac systolic indices

left cardiac diastolic indices

left cardiac systolic indices

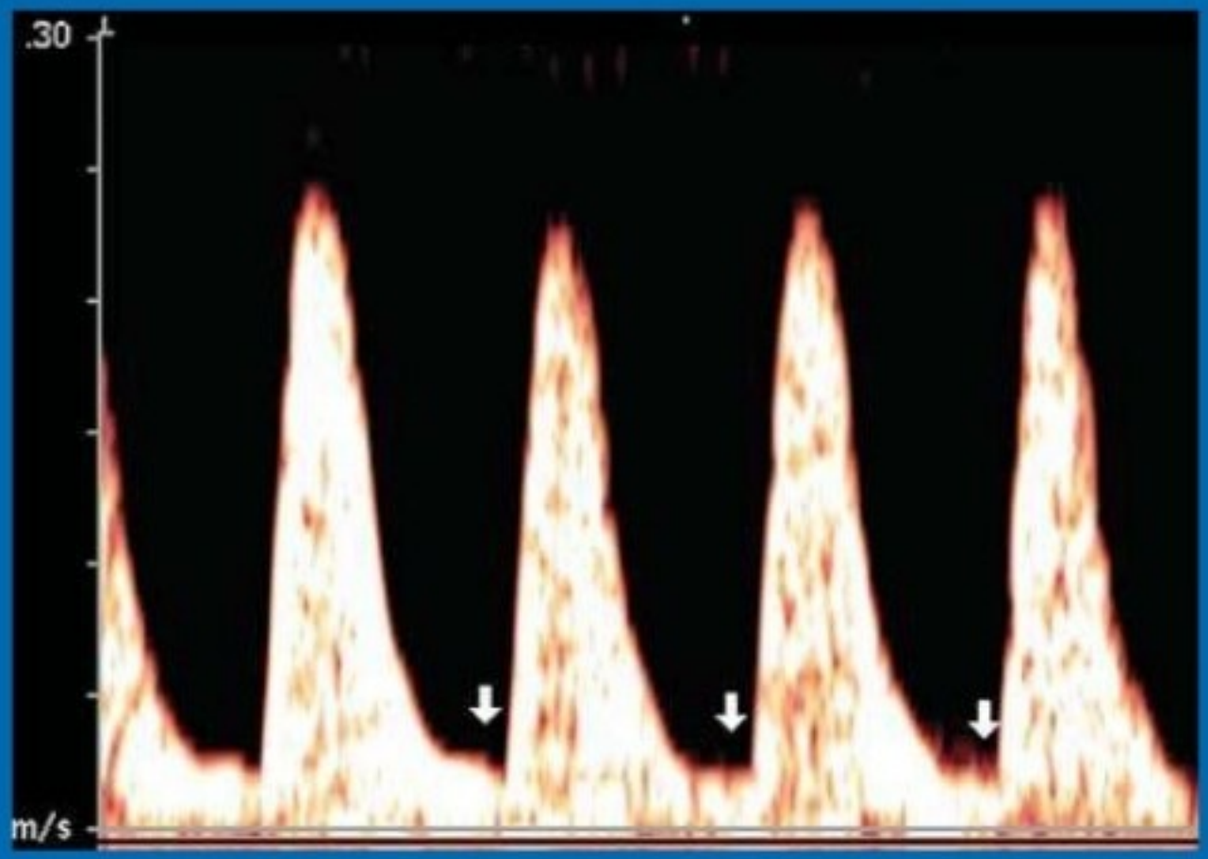
Preserving the left systolic function as the last variable to become abnormal ensures an adequate left ventricular output, which supplies the cerebral and coronary circulations

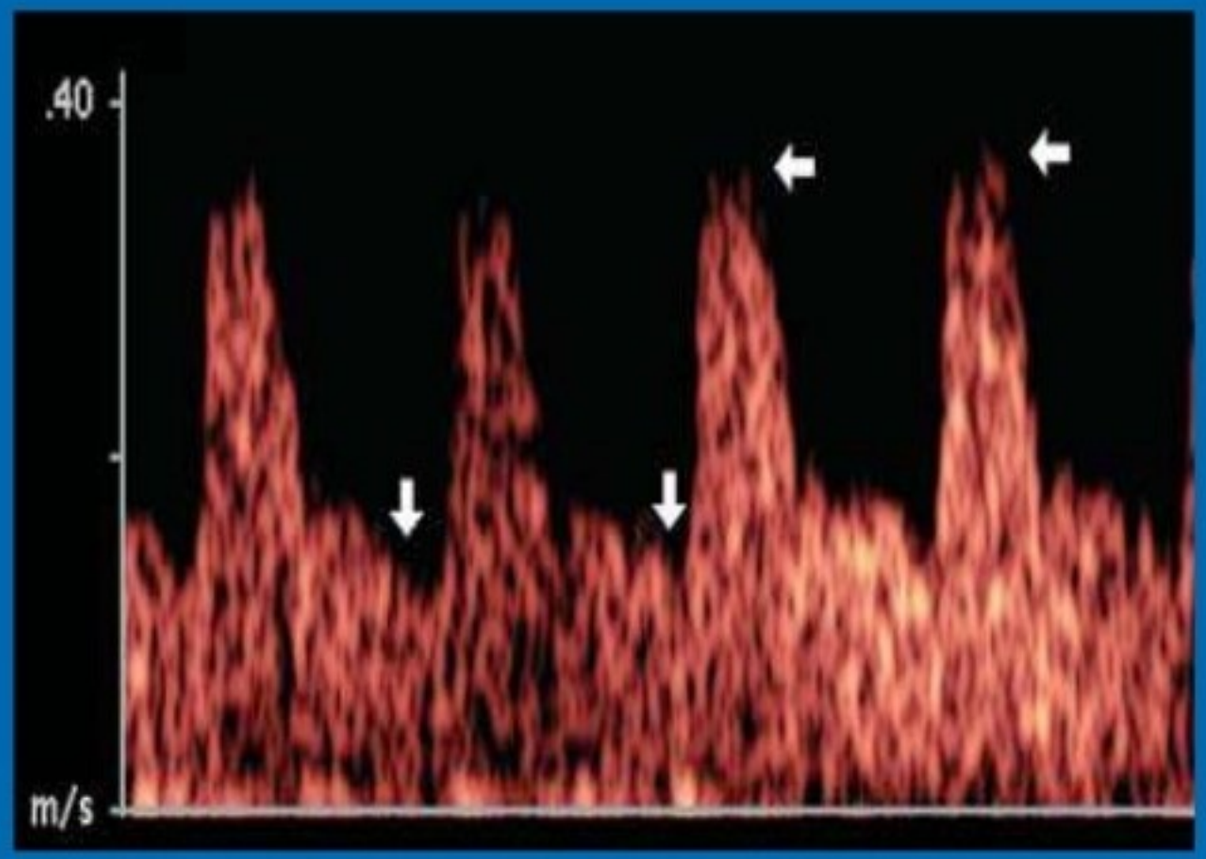
Doppler staging of Intrauterine Growth-Restricted Fetuses

Stage	Doppler finding
Stage I	An abnormal UA An abnormal MCA PI
Stage II	An abnormal MCA PSV Absent/reversed diastolic velocity in the UA UV pulsation An abnormal DV PI(an absent DV A wave is considered part of this stage)
Stage III	DV reversed flow UV reversed flow An abnormal TV E/A ratio i.e. >1 Tricuspid regurgitation

Each stage was further divided into A and B when the AFI was less than or greater than 5 cm, respectively

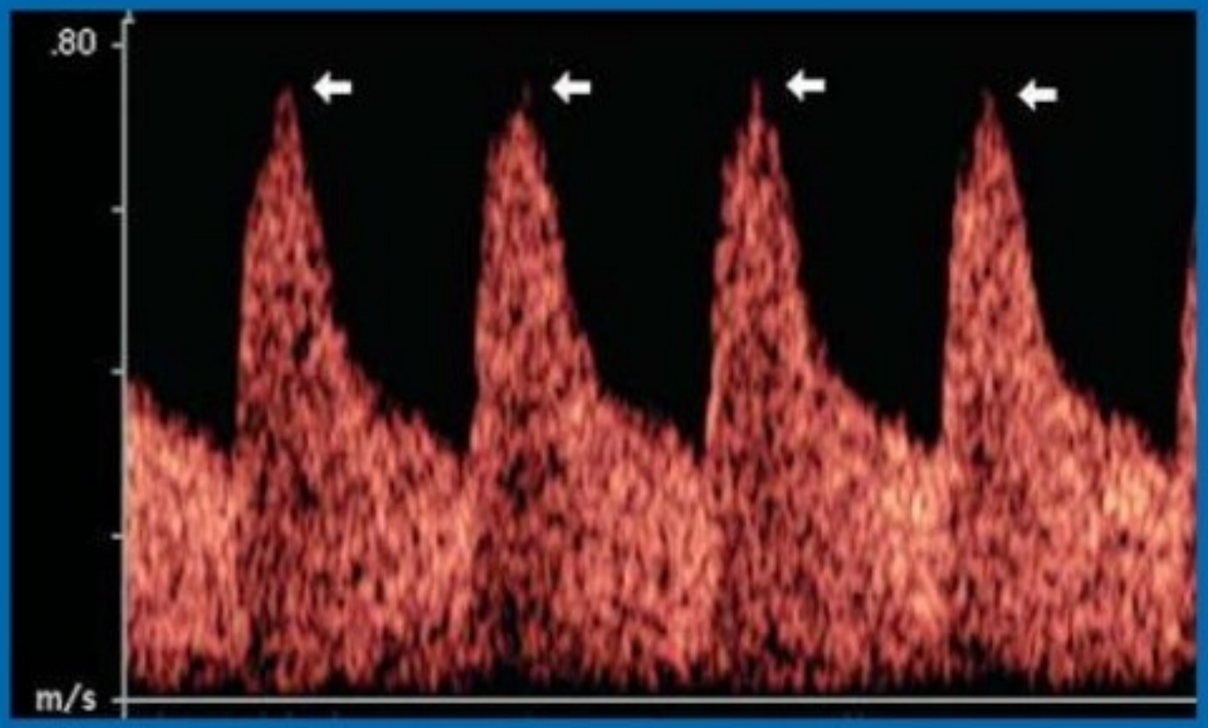
Stage I

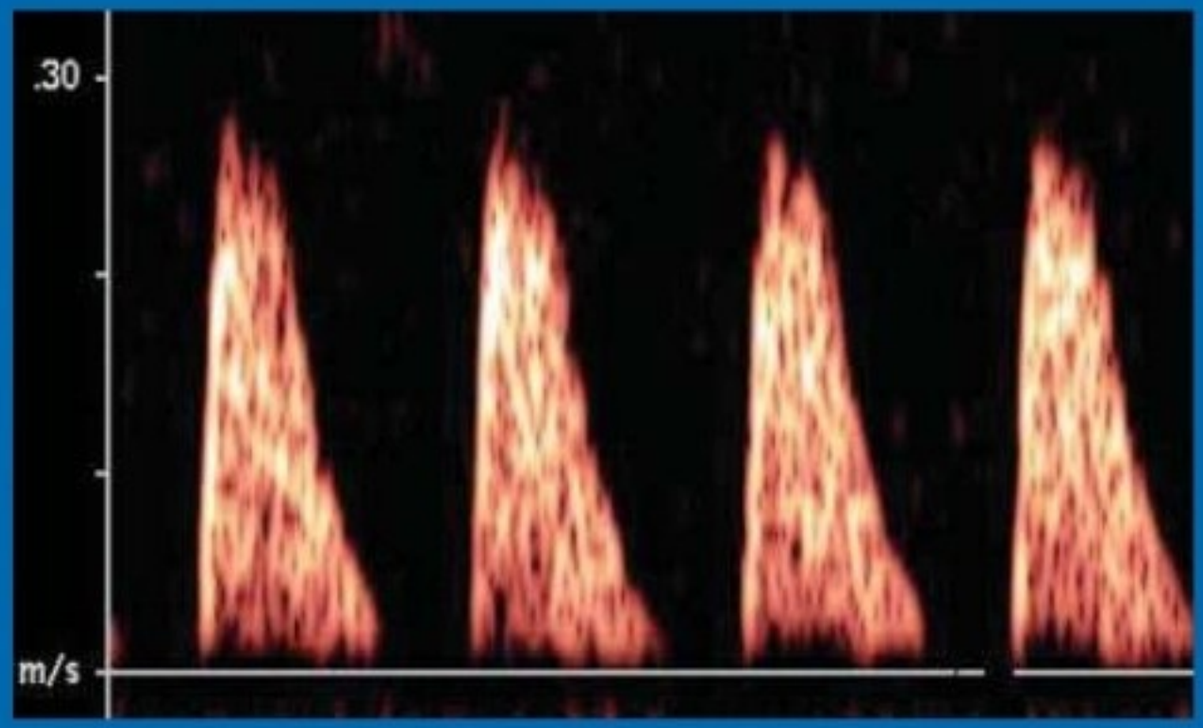


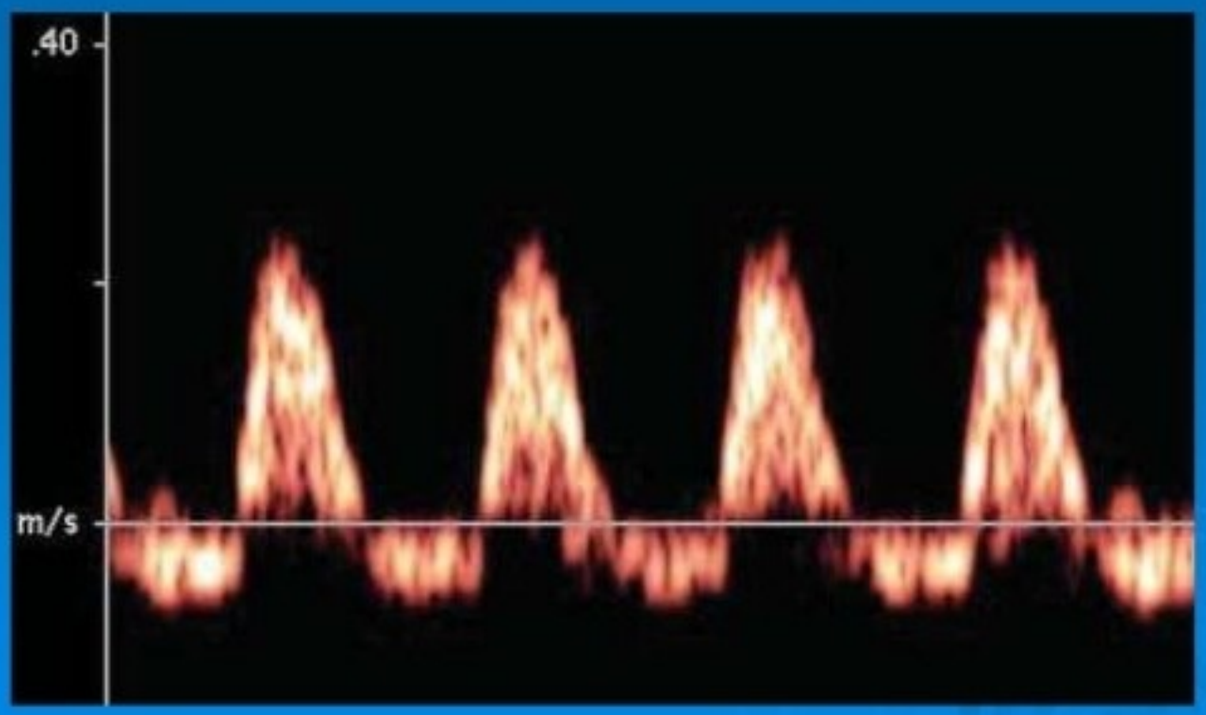


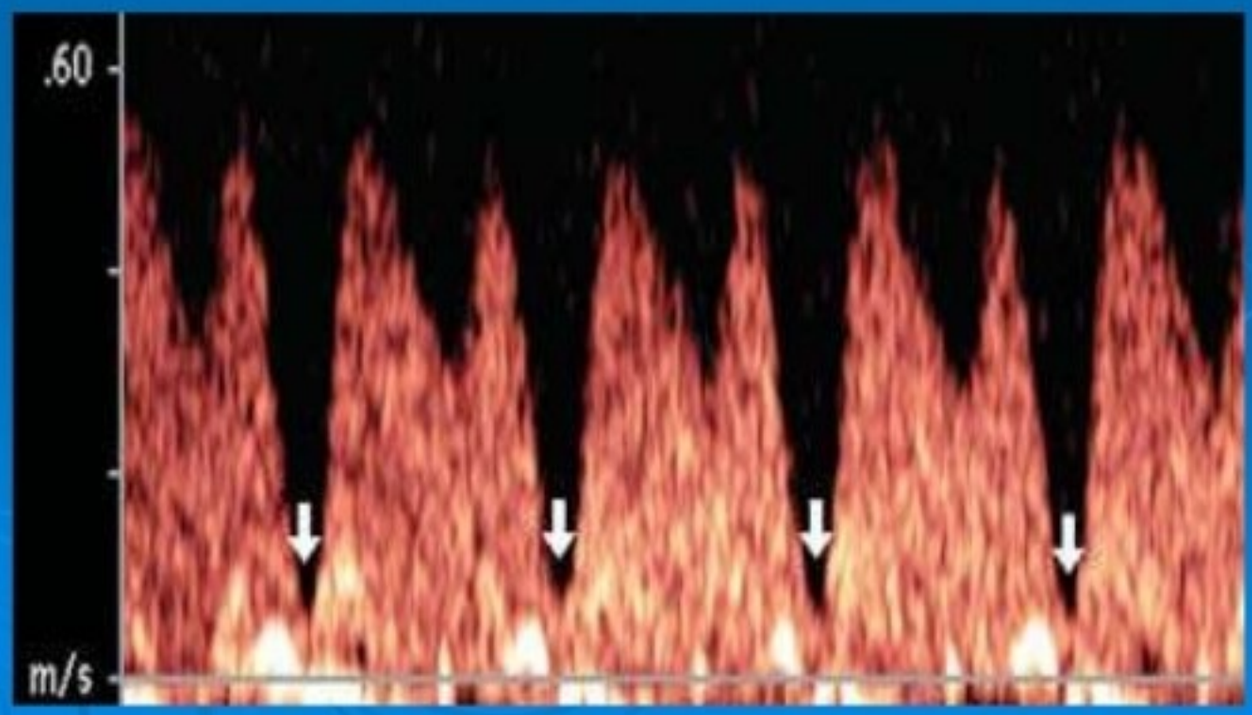
A, Abnormal UA Doppler flow. The arrows point to the low diastole, indicating high placental resistance.
B, Abnormal MCA Doppler flow at 27 weeks' gestation. The vertical arrows point to the diastole, which is increased, indicating a "brain-sparing effect"; the horizontal arrows indicate the PSV, which appears normal. An abnormal PI in either the UA or MCA characterizes stage I.

Stage II-Abnormal MCA waveform,absent and reversed umbilical artery,low a wave with high PI in DV

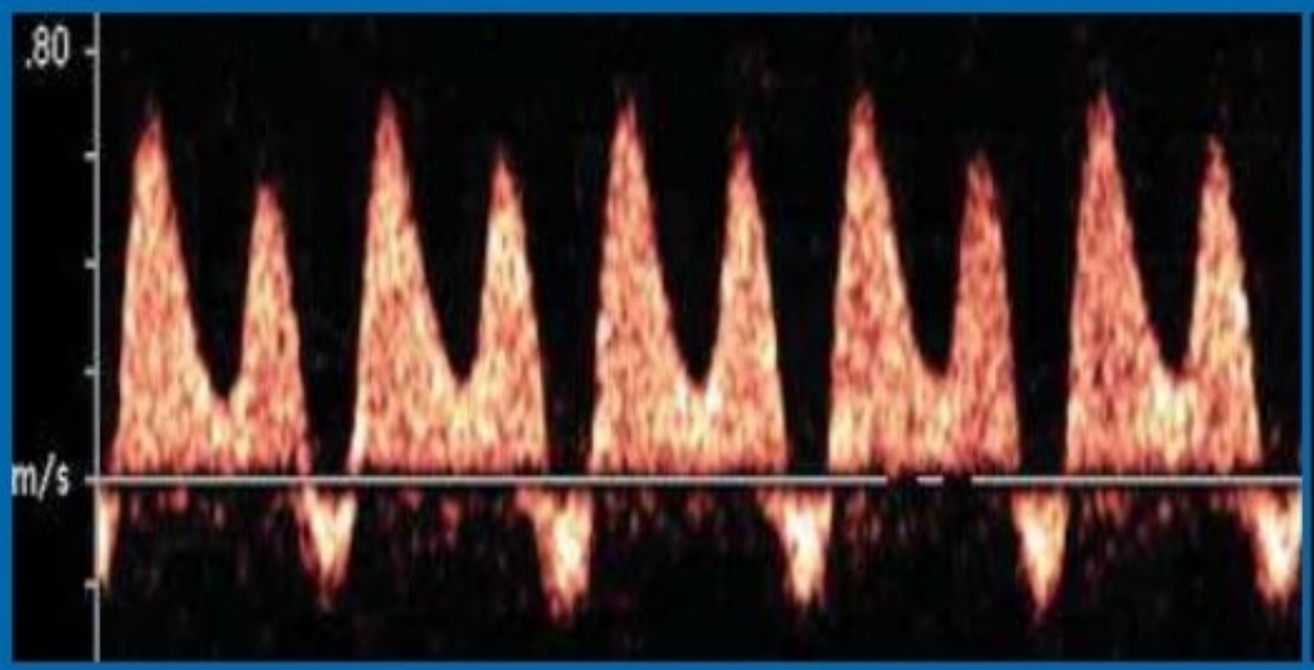




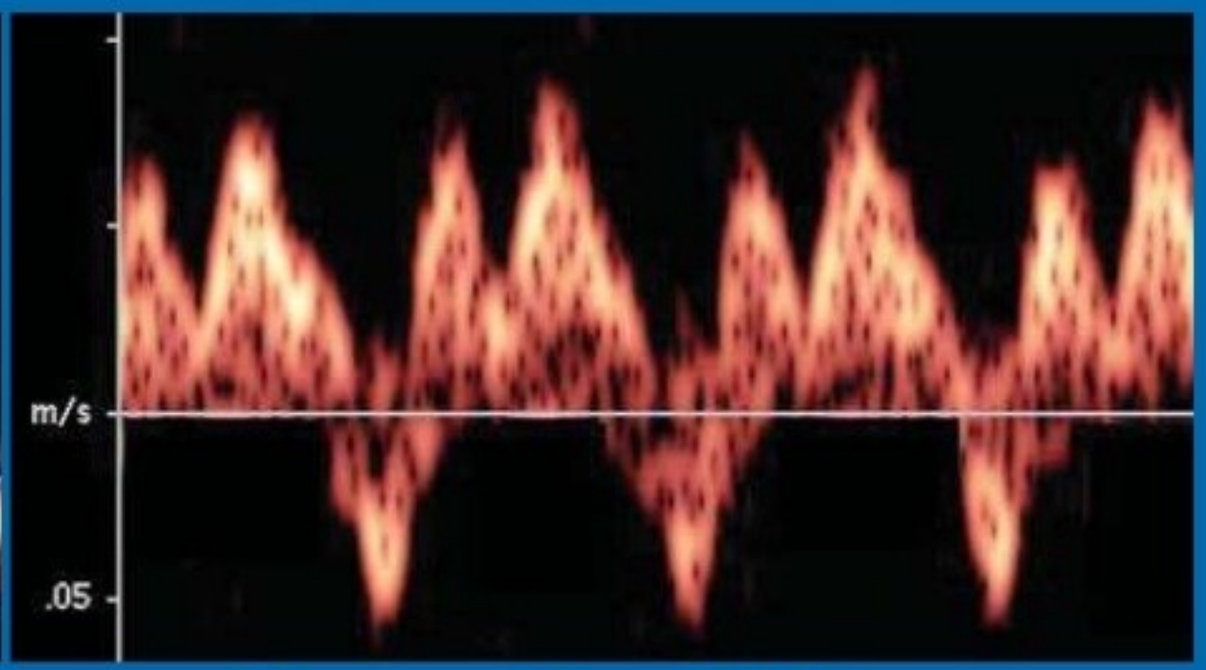




Stage III



Reversed flow in DV



Reversed flow in UV

an abnormal TV waveform (E/A ratio >1).

- Stage I fetuses have mild IUGR, and we can treat these patients as outpatients, whereas stage II and III patients need to be admitted to the hospital.

- Stage II patients are admitted for observation, whereas stage III patients are at high risk for fetal death.

- At the other extreme, the mortality for stage III fetuses was high

  50 % if DV flow is reversed,

  85 % if DV flow is reversed with one of parameters of stage III) whereas the mortality in stage II fetuses was intermediate between the 2 other stages

Doppler in TTTS

- Occur in monochorionic twins
- Doppler measurement of umbilical artery has excellent prognostic role to assess patients with TTTS.
- Serial evaluation is important in timing and choice of fetal intervention.
- Abnormal doppler findings are absent or reversed end diastolic flow in umb artery,reversed flow in DV or pulsatile flow in umbilical vein in recipient fetus.

- Treatment include conservative management,serial amnioreduction,laser photocoaglation of communication vessels,septostomy,selective foeticide.

- When twin undergo laser therapy or amnioreduction, the MCA PSV allows diagnosis of fetal anemia and indicates need for IUT in recipient after laser therapy.

Obstetric doppler applications
An overview

- Upto 11 wks – Far, few or none
- 11 to14 wks – Aneuploidy screening
- 2nd Trimester – Congenital anomalies [e.g. aneurysm of vein of Galen, teratoma in fetal neck, d/d lung sequestration from micro cystic CCAM , vascular hepatic tumors, cardiac], Uterine a. Doppler
- 3rd Trimester – Fetal Well being

Case : 1 Mrs. X presents for fetal growth assessment & surveillance at 32 wks of gestation

USG

SLF

Fetal size: 30 wks[50pct]

Est. fetal wt.–1.6kg[10pct]

HC/AC Ratio 1.1

FM good

No anomalies

Placenta – G 1

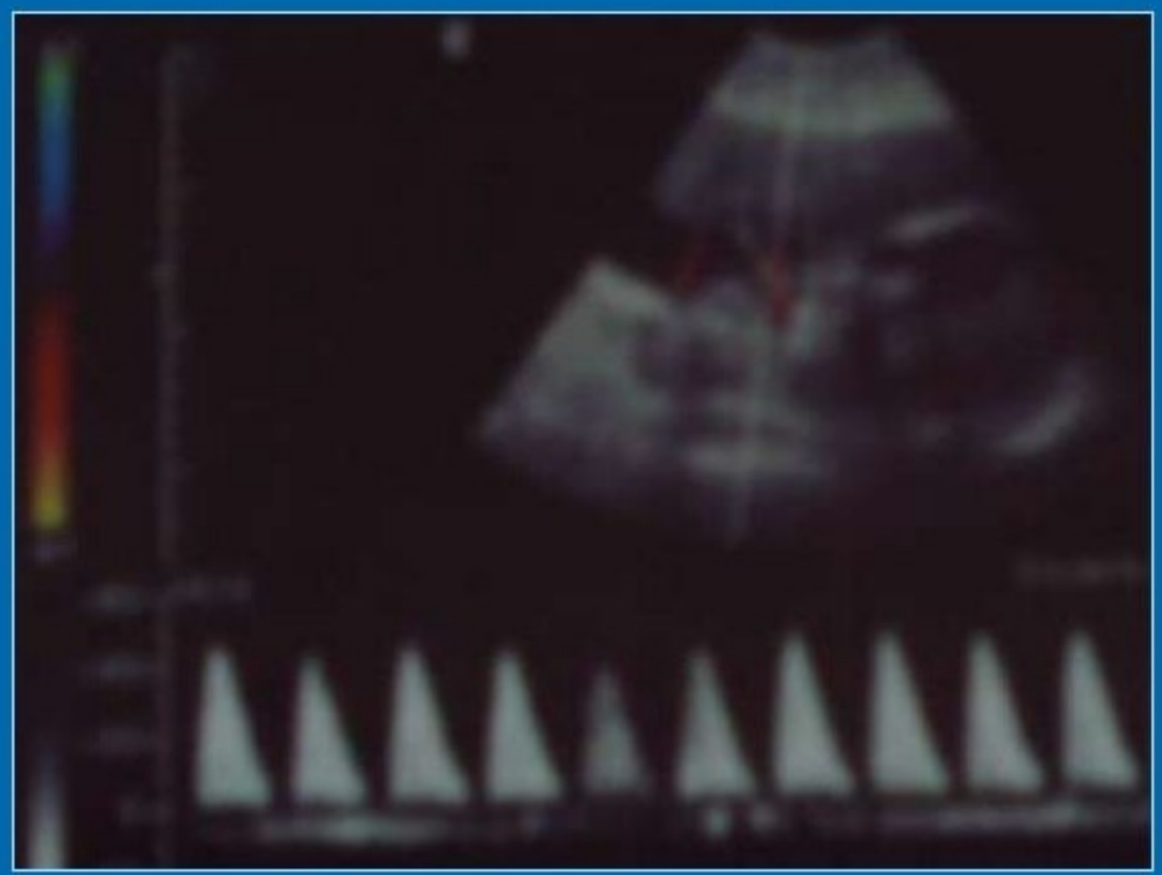
AFI - 5

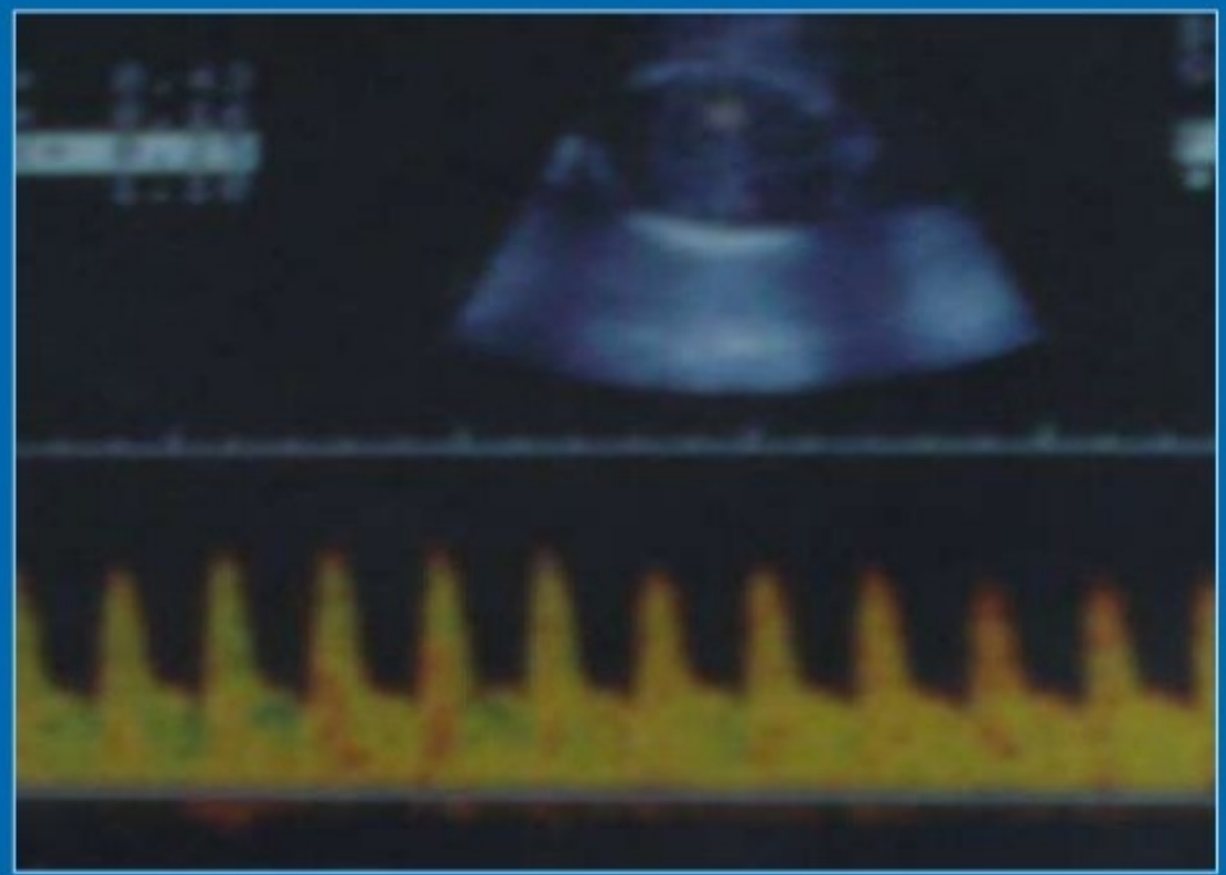
BPP

Fetal tone	2
FM	2
Breathing	0
Liquor	2

CTG borderline

Oligoamnios, 10thpct size & borderline reactivity





MCA PI 1.15 [< 5th pct]

Comments

Absent diastolic flow in UA

Increased dia. Flow in MCA

Normal UT. A. Waveforms

Inference

Raised Fetopl. PVR

Early Brain sparing effect

Normal Uteropl. PVR

?? MANAGEMENT ??

AEDF, oligoamnios, 10th pct size & borderline reactivity in a 32 wks gestation

Indication for intense surveillance

Serial doppler/CTG biweekly

AFI weekly or biweekly

Biometry only after 2 weeks

Supportive therapy [rest, monitoring]
20 days gained
No doppler deterioration, good FM
EFW=1.7 kg, AFI 5,5,1
Steroids
LSCS when AFI Dropped 1
1.8 kg baby delivered, did well without NICU admission

Doppler helped to recognize an at risk fetus .It helped to prolong pregancy & thereby avoid complications of prematurity

Moral – no intervention based on AEDF

When do we intervevne?

GA > 34 weeks

Doppler deterioration

CTG – NR

AFI Falls

Static fetal Biometry

Maternal indication

FGR by US Biometry[<10th pct]

FM – Kick count – daily

Doppler, NST,BPP - Weekly

Reassuring

Continue surveillance

>95th pct UmA DI

Rising UmA DI

AEDF

Intense surveillance

Non – reassuring

Multiple tests

Deliver

UmA AEDF

> 34 WKS

Deliver

Tests reasuuring

Continue suryeillance

=/< 34 WKS

Daily NST, BPP, Doppler

REDF, NST-NR, BPP< 4

Deliver

Case: 2 Mrs. Y, 20 yrs old primi with PIH presents for a scan. Clinically SFD ut. GA of 28 wks from dating scan. PIH uncontrolled

USG

SLF

25 WKS

EFW:0.8 kgs [10th pct]

FM infrequent

Cardiomegaly

IVC dilated

No anomalies

PI - G 0

AFI - 0

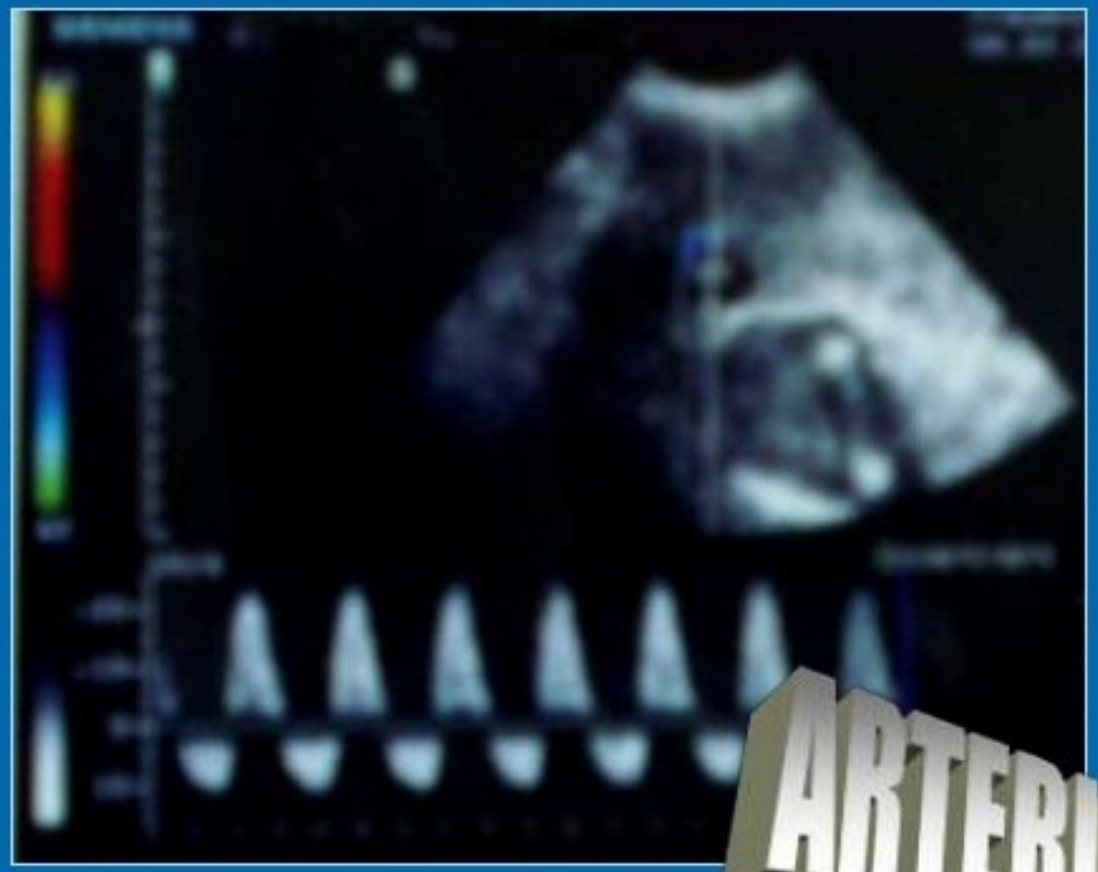
BIOPHYSICAL ACTIVITY

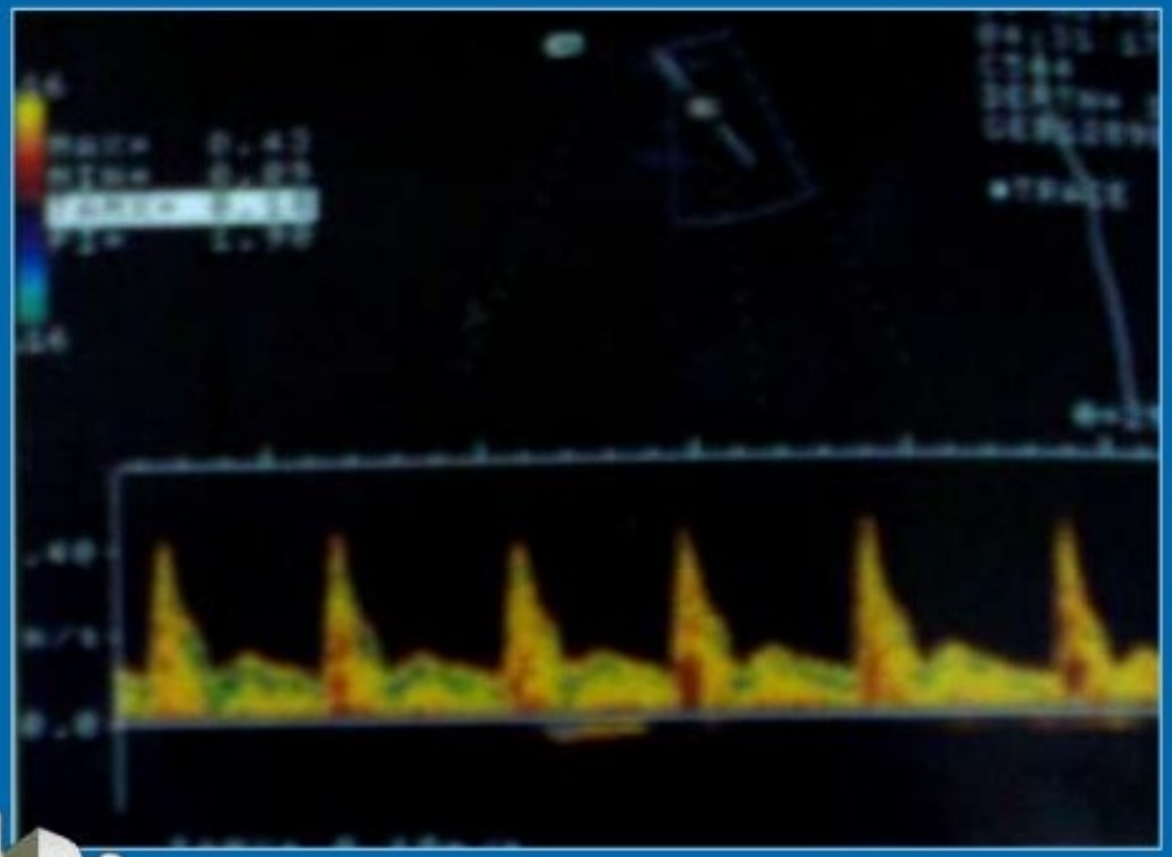
POOR

CTG not done

Symm. IUGR, Sick fetus, Anhydamnios

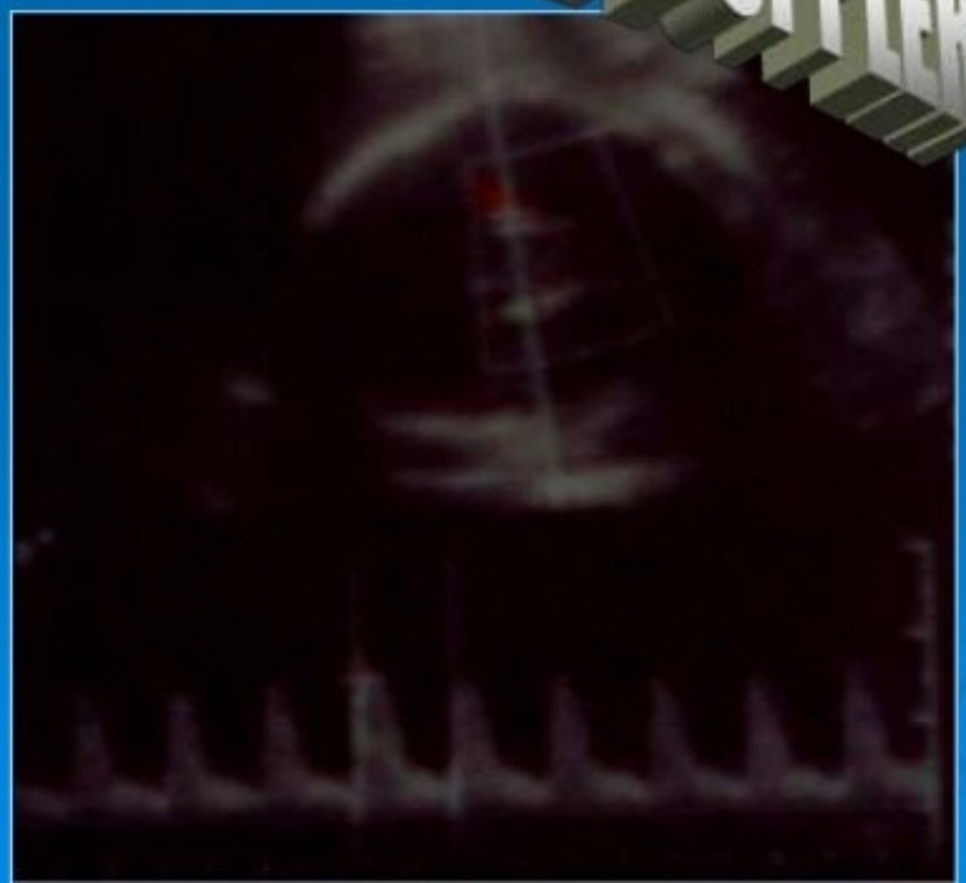
Adv: Doppler





ARTERIAL DOPPLER

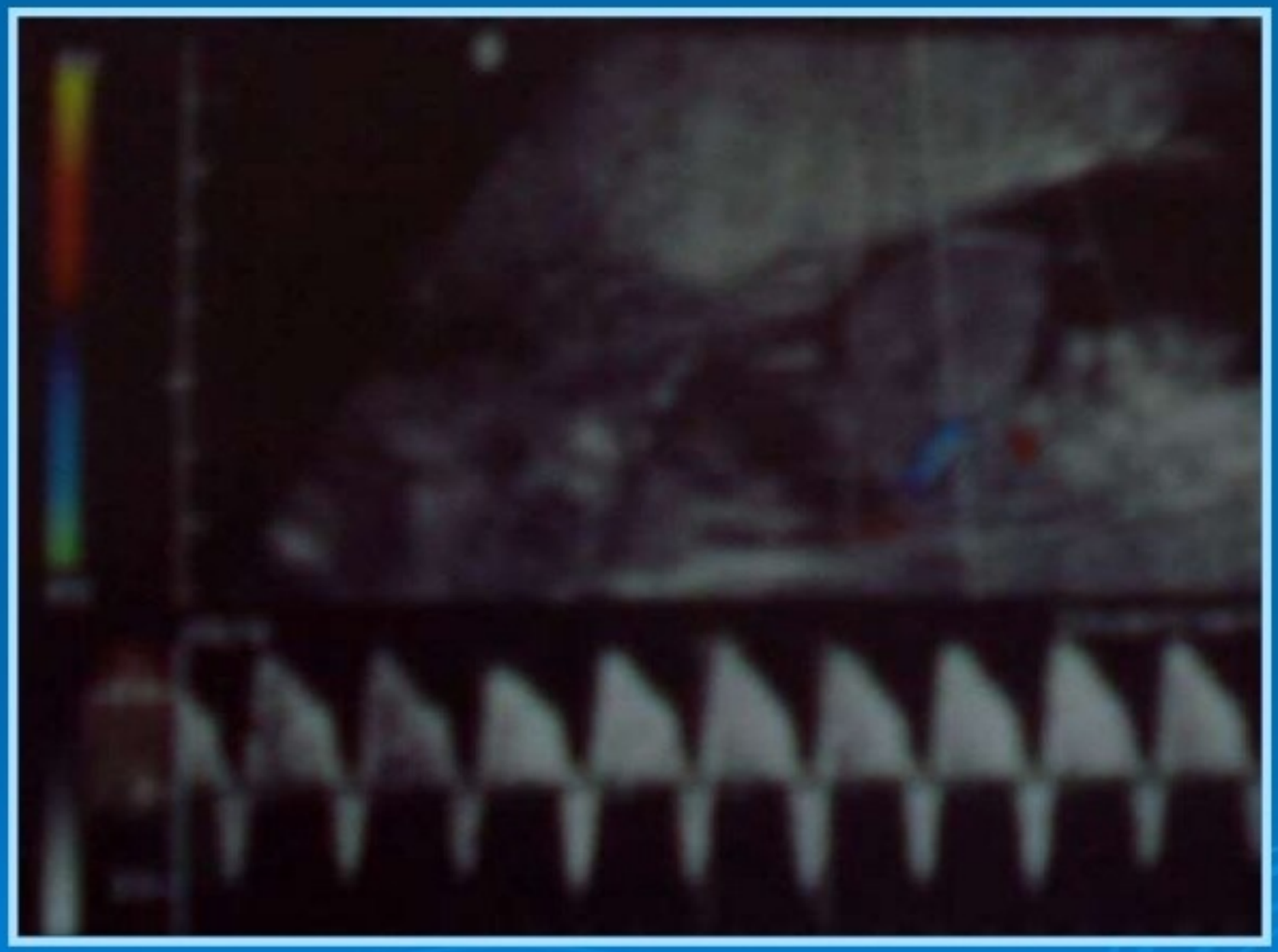
UA - REDF



Lf. UT. A. NOTCH

MCA SDR - NORMAL

DV: Reversal of ‘A’ wave



Comments	Inference
REDF in UA	Severely raised fetopl. PVR
Fairly high MCA SDR	Cerebral oedema
Bilat. Notch	Abn. Uteropl. PVR
DV: Negative ‘A’ wave	HYPOXIC & ACEDEMIC FETUS

CTG – NOT DONE

MANAGEMENT ?

TOP with cerviprim & oxytocin

750 gms. SB fetus delivered, no liquor

Maternal hypertension setteled after delivery

Here doppler helps to confirm terminally sick fetus

Doppler interpretation in conjunction with

- Gestational age
- EFW
- AFI
- Biophysical activity
- Cardiotocography

In a nutshell

- Umbilical a. doppler is placental test
- We are extrapolating pl. test on to the fetus
- IUGR fetus need not necessarily have abn. UA SDR
- At least 70% of pl. vascular bed should be affected to produce doppler changes
- An AGA fetus may show abnormal UA doppler

In a nutshell

- The window for doppler application is 28-30 wks as CTG interpretation is difficult & decision to deliver needs more substantiation of compromise
- Aim: avoid prematurity & deliver a healthy neonate
- No routine doppler

In a nutshell

- Surveillance & decision making is not only on the merit of doppler but a combination of biometry, liquor, CTG & clinical data
- Exception: RDF or ABNORMAL VENOUS WF
- In a classical pl. insufficiency situation doppler changes predate FHR changes

VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Invitation

CME and Workshop on Basic & Advanced Life Support

Date:10th January 2021

Organized by: Department of Anesthesiology, Velammal Medical College and Research Institution, Madurai .

Dear Colleagues ,

The Department of Anesthesia takes immense pleasure in inviting you for the Continuing Medical Education programme and workshop on **"Basic Life Support and Advanced Life Support"** for Internees and Practitioners.

We request all practitioners and CRRI'S to enroll and strengthen skills in managing cardiac arrest scenarios.

Dr.S.C.Ganesh prabhu,
Dr.R.M.Rajamuthiah

Organizing chairman

Dean

Dr. T.Thirunavukkarasu

Dr. P. Ramadevi

Medical Superintendent

Organizing secretary

Venue : 3rdFloor Auditorium , VMCH &RI
Date : 10.01.2021

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009, T.N.

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VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

CME and Workshop on Basic & Advanced Life Support

Programme Schedule of The Scientific Session

Date : 10.01.2021

08.30 – 09.00am	**Introduction to CME**	**Dr. S.C.Ganesh Prabu**	
Time	**Topic**	**Chairpersons or other resource persons**	**Speaker**
09.00 - 09.45 am	Lecture on basic life support	Prof. Dr. T.Thirunavukkarasu	Dr. Poornima
09.45 -10.30 am	Lecture on advanced life support	Prof. Dr. S.P.Meenakshi Sundaram	Dr. John vinodhan
10.30 -10.45 am	**Tea Break**		
10.45 – 11.30 am	Drugs used in life support	Prof. Dr. T.Nirmaladevi	Dr. Siva kumar
11.30 – 12.15 pm	Equipment	Prof. Dr. P. Mageswari	Dr. Chitra devi
12.15 – 1.00 pm	**Lunch Break**		
1.00- 2.00 pm	Workshop on basic life support	Prof. Dr. T.Thirunavukkarasu	Dr. Arun shankar
2.00- 3.00 pm	Workshop on advanced life support	Prof. Dr. S.P.Meenakshi Sundaram	Dr. Ramnarayanan
3.00 – 03.15 pm	**Tea Break**		
03.15 – 4.15 pm	Demonstration of equipment used in life support	Prof. Dr. P.Mageswari	Dr. J.N.C.Hamilton
4.15 – 5.15 pm	Drugs used in life support	Prof. Dr. T.Nirmaladevi	Dr. Lavanya

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
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Anuppanadi, Madurai-625 009, T.N.

VELAMMAL MEDICAL COLLEGE
HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

Date:17.12.2020

From

Dr. S.C.Ganesh Prabu,

Prof & HOD,

Dept. of . Anaesthesia,

VMCH & RI,

Madurai.

To

The Dean,

VMCH & RI,

Madurai.

Respected sir :

Sub: Permission to conduct a CME on BLS and ACLS for CRRI Current batch on 03.01.2021 & 10.01.2021.

As we are planning to conduct a CME &workshop on BLS and ACLS for current CRRI batch, Total CRRI will be split up into two batches without affecting the regular work. One batch will be attending on 03.01.2021 Sunday and another batch on 10.01.2021 Sunday. Registration is free and a certificate for attending the CME with credit hours from DR MGR university will be given to the participants.

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
Anuppanadi, Madurai-625 009.

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MADURAI - 625009

Kindly we request you to permit us to conduct the CME on those days mentioned above and permit us to use the 3rd floor auditorium on those days and also request you to issue circular to the respective HOD's to depute the CRRI's for the BLS ACLS workshop for those days.

Thanking you

Yours sincerely

Dr. S.C.Ganesh Prabu

Prof & HOD,

Dept. of . Anaesthesia,

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
Madurai-Tuticorin Ring Road
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HOSPITAL AND RESEARCH INSTITUTE
MADURAI - 625009

From
The Dean,
Velammal Medical College & Research Institute,
Madurai.

To
The Registrar,
Tamil Nadu Medical Council,
Chennai.

Respected sir :

Sub: Accreditation of credit points for the CME Activity requested regarding.

Department of Anesthesia, Velammal Medical College & Research Institute are organizing a continuing Medical Education Programme and workshop on Basic Life Support and Advanced life support for Internees and practicing doctors, on 10.01.2021.

I hereby make a request to accreditation of the CME / Credit hours/ Points for the same.

Thanking you

Yours Truly,

The Dean

Prof. T. THIRUNAVUKKARASU, M.D.,D.A.,
Dean
Velammal Medical College Hospital
and Research Institute
"Velammal Village"
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Equipments used in ACLS

DR. R. CHITHRA DEVI

Patient requiring resuscitation

↓

secondary to LOC

↓

assessment & control of airway & **ventilation of lungs**

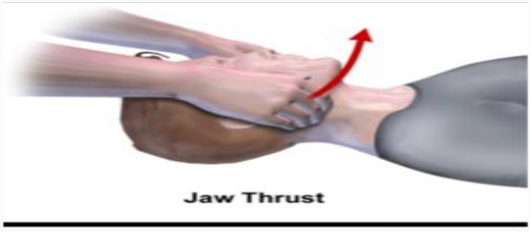
↓

to prevent **hypoxic damage** to brain

Basic airway management

Head tilt & Chin lift

Jaw Thrust

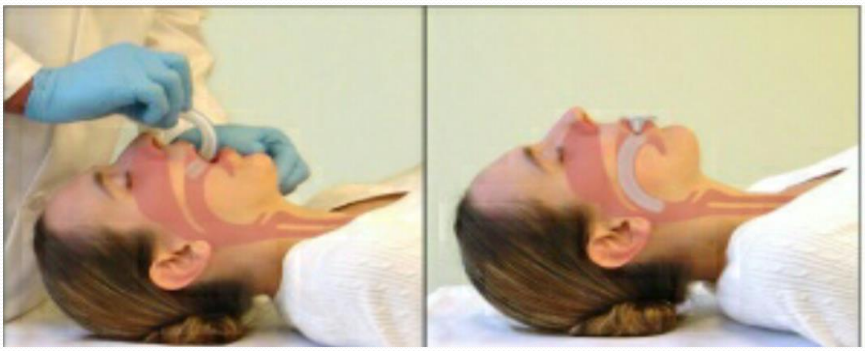


Dr. Arthur Guedel – 1883-1956

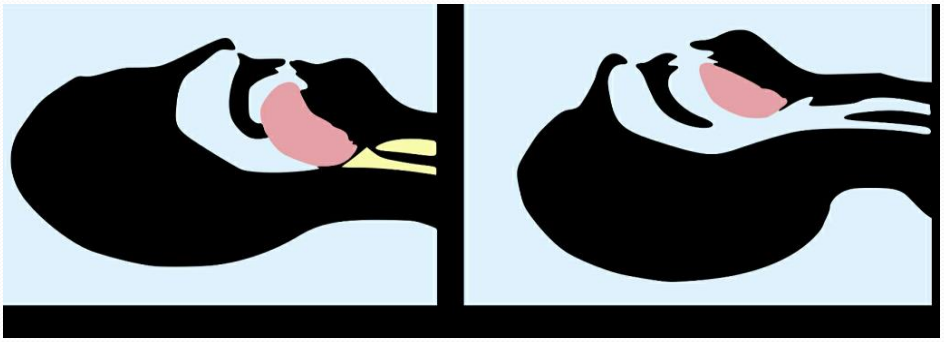
Oropharyngeal airway

- Variable sizes
- Pts incisors to angle of mandible
- Comatose patient

Insertion of oropharyngeal airway



Cleared Airway

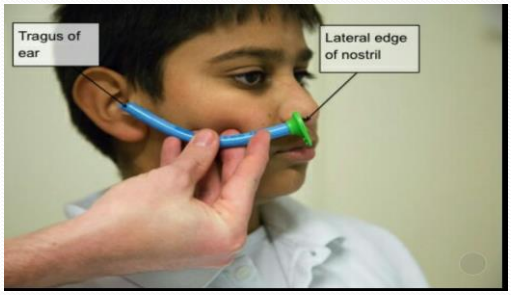


Nasopharyngeal airway

- Pt who are not deeply unconscious, clenched teeth, trismus, maxillofacial injuries.
- Contraindicated in base of skull #

Nasopharyngeal airway

- Correct size of nasopharyngeal airway
- 6-7mm – adults
- Bleeding 30%



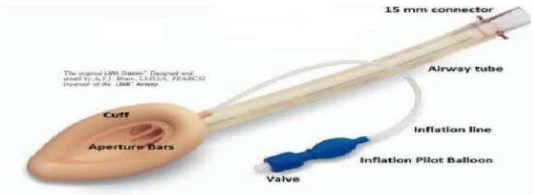
Insertion of nasopharyngeal airway

Advance airway devices

- Combitube
- LMA
- Laryngeal tube

There are no data supporting the routine use of any specific approach to airway management during Cardiac arrest. The best technique is dependant on the **precise circumstances of the cardiac arrest** and the **competance of the rescuer.**

LMA Classic



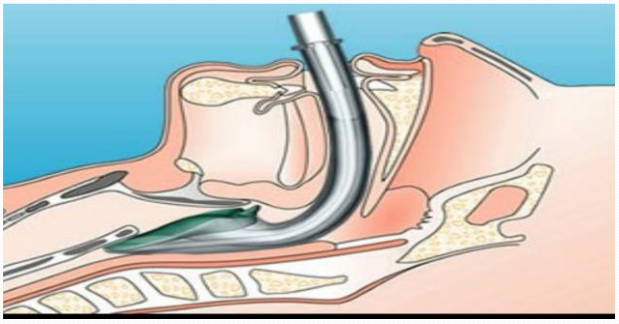
Laryngeal mask airway

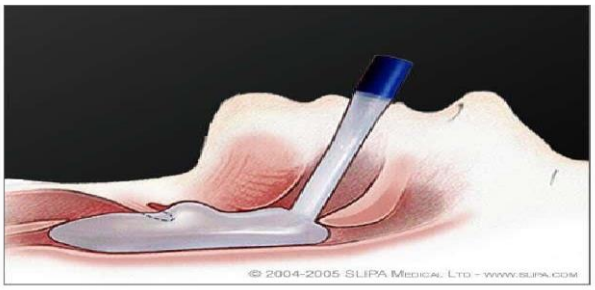
- Easier to insert, when compared to TT:
- Successful ventilation 72-98%
- More efficient than BMV
- Gastric inflation reduced

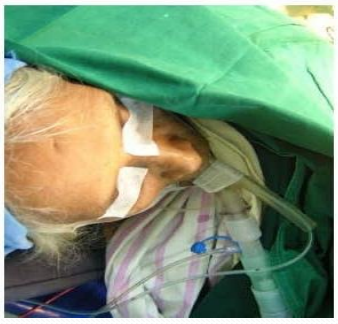
DISADVANTAGE

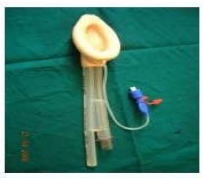
- Inadequate ventilation for low Lung /chest wall compliance
- May dislodge during compression

Insertion of LMA









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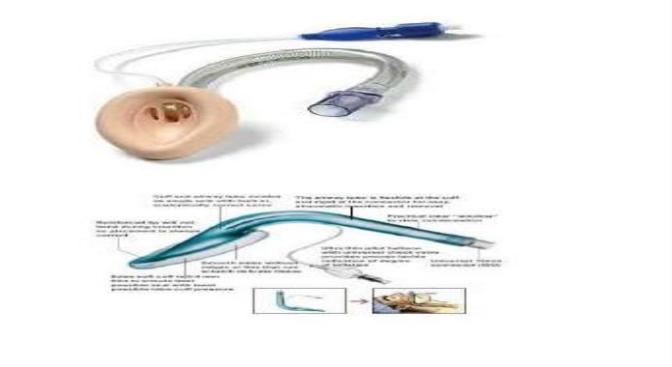

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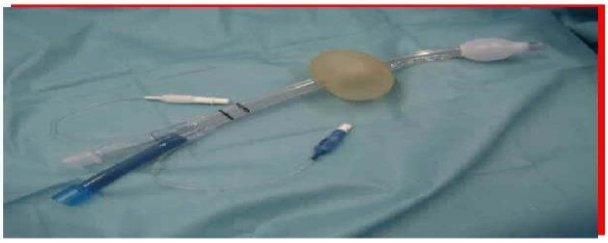
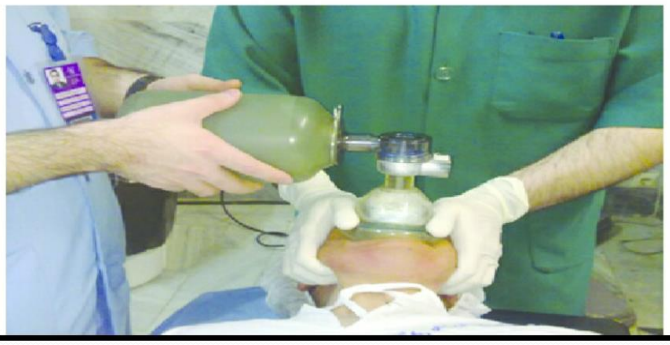
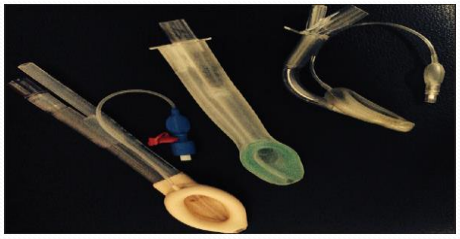


Two person technique for BMV



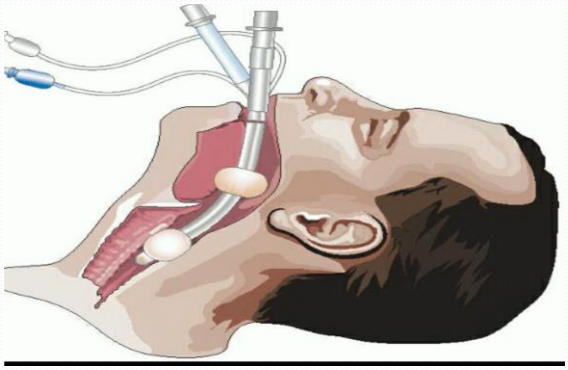
Laryngeal mask airway



The combitube

- Double lumen tube
- Successful ventilation 79%-98%
- Safe and effective

Insertion of combitube



Tracheal tube

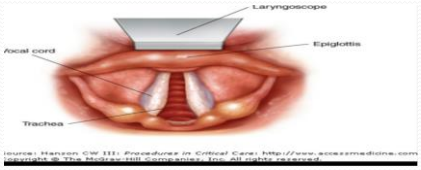
- Optimal method
- Only trained person

Advantages

- Definitive airway, protects from aspiration
- To suck airway secretion
- Adequate TV ,uninterrupted chest compressions.

- **Disadvantages**

❑Misplaced tube
❑Experienced personnel
❑High failure rate



❑Life threatening conditions (a/c epiglottitis , pharyngeal pathology, head injury, cervical spine injury)

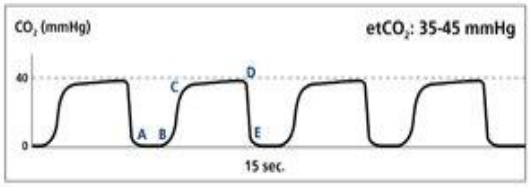
Confirmation of tracheal intubation

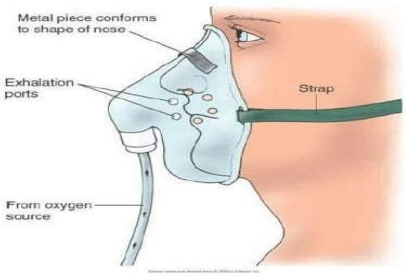
- **Primary techniques:**

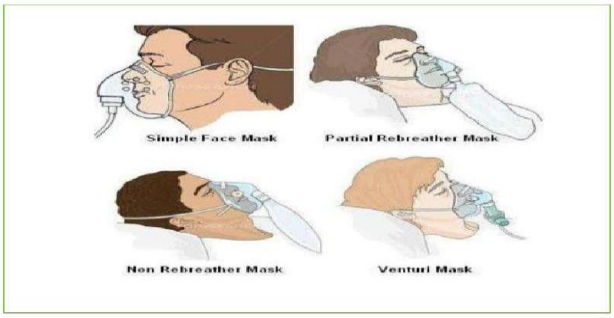
❖b/l chest expansion
❖5 point auscultation
❖Condensation in tube

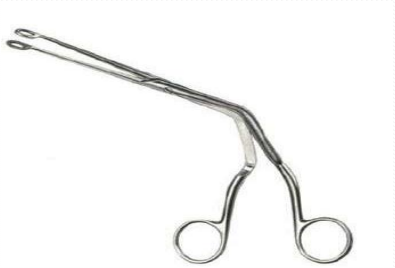
- **Secondary technique:**

❖ETCO2 monitoring



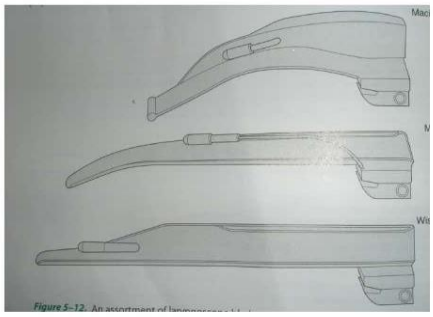


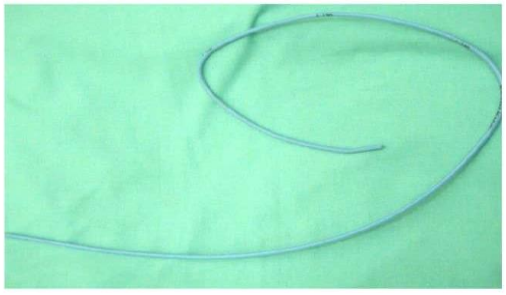




Suction

- Yankauer s suction





AED

- Voice guided machine
- Useful for non-healthcare rescuers

- AED- “the single greatest advance in the treatment of VF cardiac arrest since the development of CPCR”
- Reliable, cheap, easily operable & portable.
- AED has a microprocessors that analyze the rhythms.

How to use AED??

1) Safety
2) Victim unresponsive- AED/Ambulance
3) Scan chest /carotid pulse(5-10sec)-no pulse->CPCR
4) Once AED arrives,
   - ➢ Switch on & wait ->attach pads
   - ➢ Follow spoken directions
   - ➢ Nobody should touch the victim

5. If a shock is indicated:
   - Ensure nobody touches the victim
   - Push shock button

6. If no shock indicated:
   - Immediately resume CPCR(30:2)

7. Continue to follow AED prompts until:

   - Qualified help arrives
   - Victim starts to breathe
   - You become exhausted

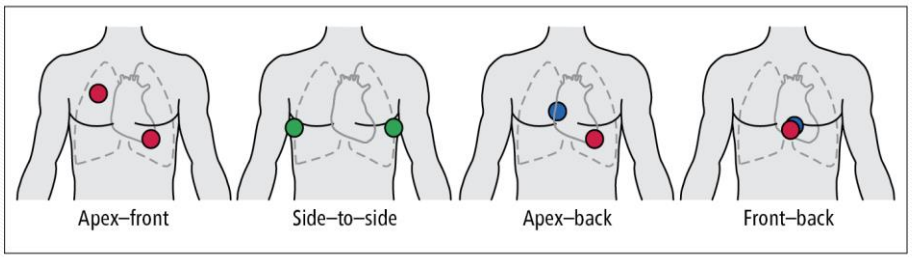
Pre defibrillation strategies

- **Safe use of O2:**
- Take off O2 mask / nasal cannula(1m away)
- If pt is connected to ventilator – detach it
- Minimize the risk of sparks during defibrillation(self adhesive pads are better)

Technique of electrode contact with chest wall

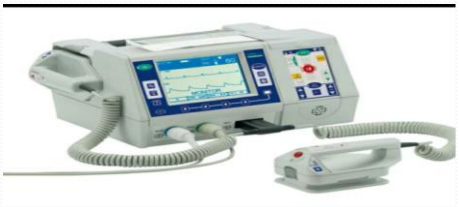
- Transthoracic impedance (70-80 ohms)
- Shaving the chest
- Electrode position
- Pacemaker, automatic implantable cardioverter defibrillator
- Transdermal drug patches

Acceptable pad positions



Manual defibrillator

- Advantage – synchronised cardioversion
- Operator interprets the rhythm



Use of manual defibrillator

- Confirm the rhythm ,shockable (VF/pulseless VT)
- Select energy monophasic(360j) ,biphasic(200j)
- Charge it (yellow button on pads)
- Apply jelly and apply pads
- Clear all

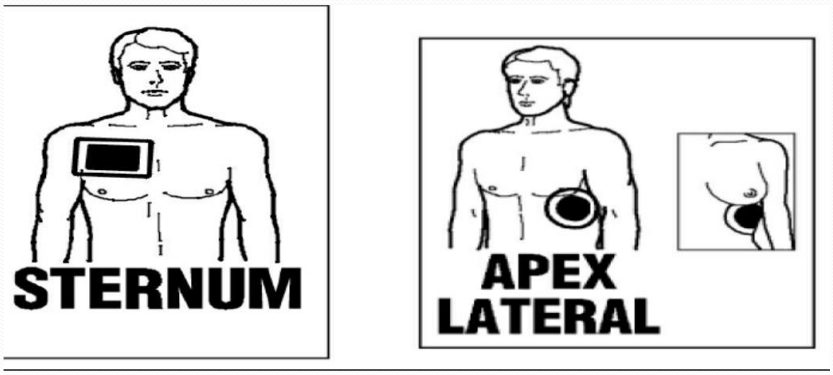
- Remove O_2 delivering system
- Press two buttons simultaneously
- Ensure shock has been delivered
- Resume CPR & analyze rhythm after 2 mins.

Artificial pacemakers

- **Non invasive**
  → Transcutaneous pacing

- **Invasive**
  → temporary transvenous pacing
  → permanent implanted pacing

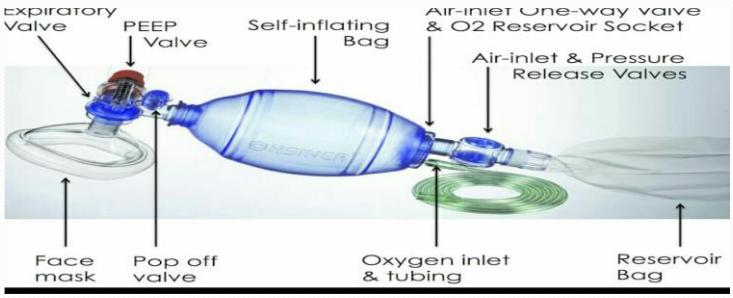
Transcutaneous pacing



Pocket mask

Ventilation

- Self inflating bag



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Thank you for listening

CPR & AED

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