

DIAGNOSTIC and SURVEILLANCE METHODS

Maternal Antibody determination by Indirect Coombs Test

USG / Color Doppler

Fetal blood sampling (FBS)

CVS/Amniocentesis (not done now)

Maternal Antibody determination by ICT

There are several classes of antibodies. The two of interest are IgM and IgG.

If the antibody can be identified as an IgM then as it does not cross the placenta because of larger molecular wt and there is no risk of hemolysis to the fetus. But IgG because small molecular wt it does cross the placenta so it is capable of causing hemolytic disease to the fetus.

A titer of > 1:4 is considered sensitized and titer > 1:32 is consider significant.

ULTRASOUND

Plays Key role in diagnosis and management.

- To be done as early as possible to establish correct gestational age which will be of help at later gestational age.
- Fetal anemia, Cardiac signs and altered fetal behavior are diagnosed by USG

Fetal anemia is detected by following parameters:

AC,

HC / AC,

Intraperitoneal volume of fluid

Intra/extra hepatic vein diameter

Placental changes

Length of RT lobe of liver

Splenic perimeter / enlargement

S/S of impending Ascites - double outlining of hollow viscera's- stomach, GB, UB, Hydrocele

Cardiac signs-

-Effusion larger then 4 mms

Biventricular outer diameter in mm grater than 1.1 times the number of weeks

COLOR DOPPLER

Fetal Anemia (Decrease in Hb) leads to reduction in viscosity leads to reduction in shearing in blood vessels leading to increase in blood velocity.

As Color Doppler Predict blood viscosity in circulation it is most helpful in predicting fetal anemia. This is added by increase in COP due to Anemia

SITES FOR DOPPLER

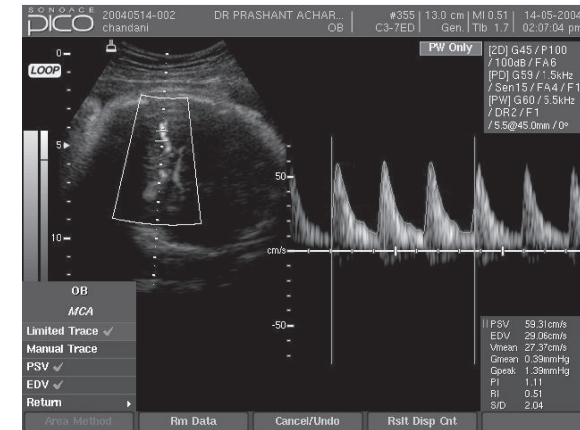
MCA

Umbilical artery

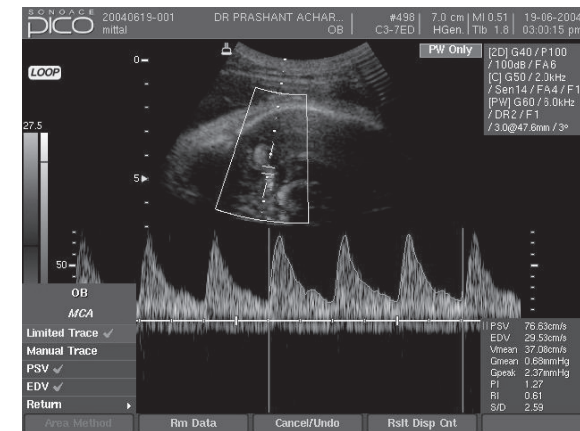
Abdominal aorta

Umbilical vein

MIDDLE CEREBRAL ARTERY (MCA) Doppler study



Normal



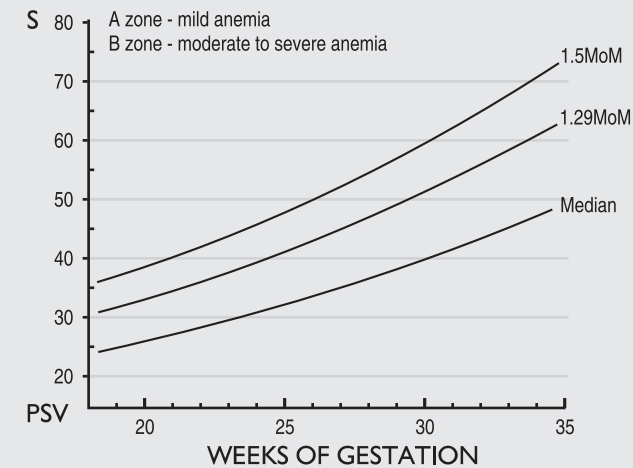
abnormal increase MCA PSV

ABNORMAL - INCREASE PSV

Proven to be the most accurate Doppler method.

If MCA PSV (peak systolic velocity) is obtained at weekly basis gives 98 % accurate predication of fetal Anemia. Its Accuracy decreases after 35 weeks of gestation.

Expected Peak Velocity of Systolic Blood Flow through MCA



The severity of fetal hemolysis can be predicted from:

- The history of previously affected pregnancies;
- The level of maternal hemolytic antibodies;
- Changes in the flow velocity waveforms obtained by Doppler studies of the fetal circulation and plot it on the graph shown above
- The altered morphometry of fetus and placenta
- The presence of pathological fetal heart rate patterns.

In red cell isoimmunized pregnancies, placentation is normal and Therefore indices of impedance to flow in the uterine and umbilical arteries are normal, Irrespective of the severity of fetal anemia. Normal placental perfusion results in normal fetal blood pO₂, pCO₂ and pH and therefore there is no evidence of redistribution in the fetal circulation; The PI in the middle cerebral artery, thoracic aorta and renal arteries is normal.

In red cell isoimmunized pregnancies, the left and right cardiac outputs and blood velocity in the umbilical vein, middle cerebral artery, thoracic aorta, renal arteries And the fetal venous system is increased in proportion to the degree of fetal anemia.

The most likely mechanism for the hyper dynamic circulation of anemic fetuses is Decreased blood viscosity, leading to increased venous return and cardiac preload.

USG CLASSIFICATION OF ALLOIMMUNIZATION

GRADE	INCREASE MCA	PLACENTA	ASCITIS	ANASARCA	ABNORMAL BPS
0	-	-	-	-	-
1	+	+	-	-	-
2	+	+	+	-	-
3	+	+	+	+	-
4	+	+	+	+	+

INDICATION OF FETAL BLOOD SAMPLING

ANY USG FINDING SUGGESTIVE OF SEVERE FETAL ANEMIA

- Significant rise in antibody titer level
- Neonatal disease requiring exchange transfusion in previous pregnancy
- Previous IUD due to Rh disease
- Fetal blood sampling (FBS) gives direct access for Haematocrit ,Direct Coombs test, fetal blood type, Reticulocyte count and total bilirubin
- It's the method of choice in present days with the availability of easy method of Cordocentesis
- Serial Amniocentesis
This was the method of choice in the past.

Fetuses affected by hemolytic disease secrete abnormally high levels of bilirubin into the Amniotic fluid. The amount of bilirubin can be quantities by spectrophotometrically measuring absorbance at the 450-nm wavelength in a specimen of amniotic fluid that has been shielded from light. Alternatively, percutaneous umbilical blood sampling (PUBS) may be used to determine all blood parameters directly. If amniocentesis is used to monitor the fetus, the results (delta 450) are plotted on a "Liley" curve.

Doppler ultrasonography of the middle cerebral artery has been used to identify fetuses at risk for hemolytic disease.

Transfusion Protocol

(IPT = Intraperitoneal transfusion

IVT = intravenous transfusion)

IPT alone -used till 1980

In hydropic fetus fetal RBCs absorption is compromised after IPT from peritoneal cavity'.