Current Management of Foetal Anaemia

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Lecture overview

- Causes of foetal anaemia
- Importance of early diagnosis
- Lines of diagnosis
- Lines of treatment
- Follow up in future pregnancies

Causes of Foetal Anaemia

- Haemolysis
- Haemorrhage
- Congenital infections
- Myeloproliferative disease
- Red cell aplasia
- Miscellaneous

Haemolytic Anaemia

- Immune Causes: Rhesus disease, Anti Kell, Duffy, ABO, etc
- Non Immune Causes:
- Alpha Thalassaemia
- Red cell enzyme defects
- Red cell membrane defects

Haemorrhagic Anaemia

- Feto-maternal Haemorrhage
- Spontaneous Foetal Haemorrhage

Congenital Infections

- The most important ones are Parvo-virus B19 and Cytomegalovirus

Patho-physiology

- In red cell isoimmunized pregnancies, maternal hemolytic antibodies cross the placenta and attach themselves onto fetal red cells, which are then destroyed in the fetal reticulo-endothelial system.
- In mild to moderate disease there is a compensatory increase in intramedullary erythropoiesis, and in severe disease there is recruitment of extramedullary erythropoietic sites, such as liver and spleen

Patho-physiology

- Fetal blood *p*O2, pCO2 and pH usually remain within the normal
- The fetal 2,3-diphosphoglycerate (2,3-DPG) concentration is increased improving delivery of oxygen to the tissues
- In severe anemia, when the oxygen content is less than 2 mmol/l, the placental capacity for lactate clearance is exceeded and the umbilical venous concentration increases exponentially

Patho-physiology

- When the fetal hemoglobin concentration deficit exceeds 6 g/dl, hydrops fetalis develops
- This may be the result of extensive infiltration of the liver by erythropoietic tissue, leading to portal hypertension, due to parenchymal compression of portal vessels, and hypoproteinemia, due to impaired protein synthesis

Patho-physiology

- Foetal anaemia is associated with increased arterial and venous blood flow velocities due to decreased blood viscosity with consequent increase in cardiac output.
- This observation can be used to time intervention for diagnosis and treatment accordingly.

Patho-physiology

- The understanding of increased speed of flow of blood in anaemic foetuses was used as a diagnostic tool by the use of Doppler assessment of Middle cerebral artery peak systolic velocity.

Diagnosis of Foetal Anaemia

- Prediction of foetal anaemia:
- 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
- The altered morphometry of fetus and placenta
- The presence of pathological fetal heart rate patterns

Diagnosis of Foetal Anaemia

- The main confirmation of foetal anaemia is by cordocentesis , however this is associated with 5% foetal loss rate per treatment.
- The procedure is used both as a diagnostic and treatment tool in the same cession.

Diagnosis of Foetal Anaemia

- The main aim is to try to predict and treat foetal anaemia before hydrops develops.
- The other target will be to diagnose the cases needing cordocentesis from the ones that can be followed conservatively

Patient ‘s History

- Maternal antibodies with previous affected pregnancy
- Raised antibodies (anti D, or others) with a titre of 15 I.U or 1/128
- Exposure to infections especially parvo virus B19
- History of bleeding in pregnancy

Laboratory tests

- Serum antibodies for Rhesus and other types.
- Check foetal cells in maternal blood can diagnose foetal rhesus status
- Serology for congenital infections.
- Indirect coomb’s test to check foetal cells in maternal blood.

Role of Ultrasound

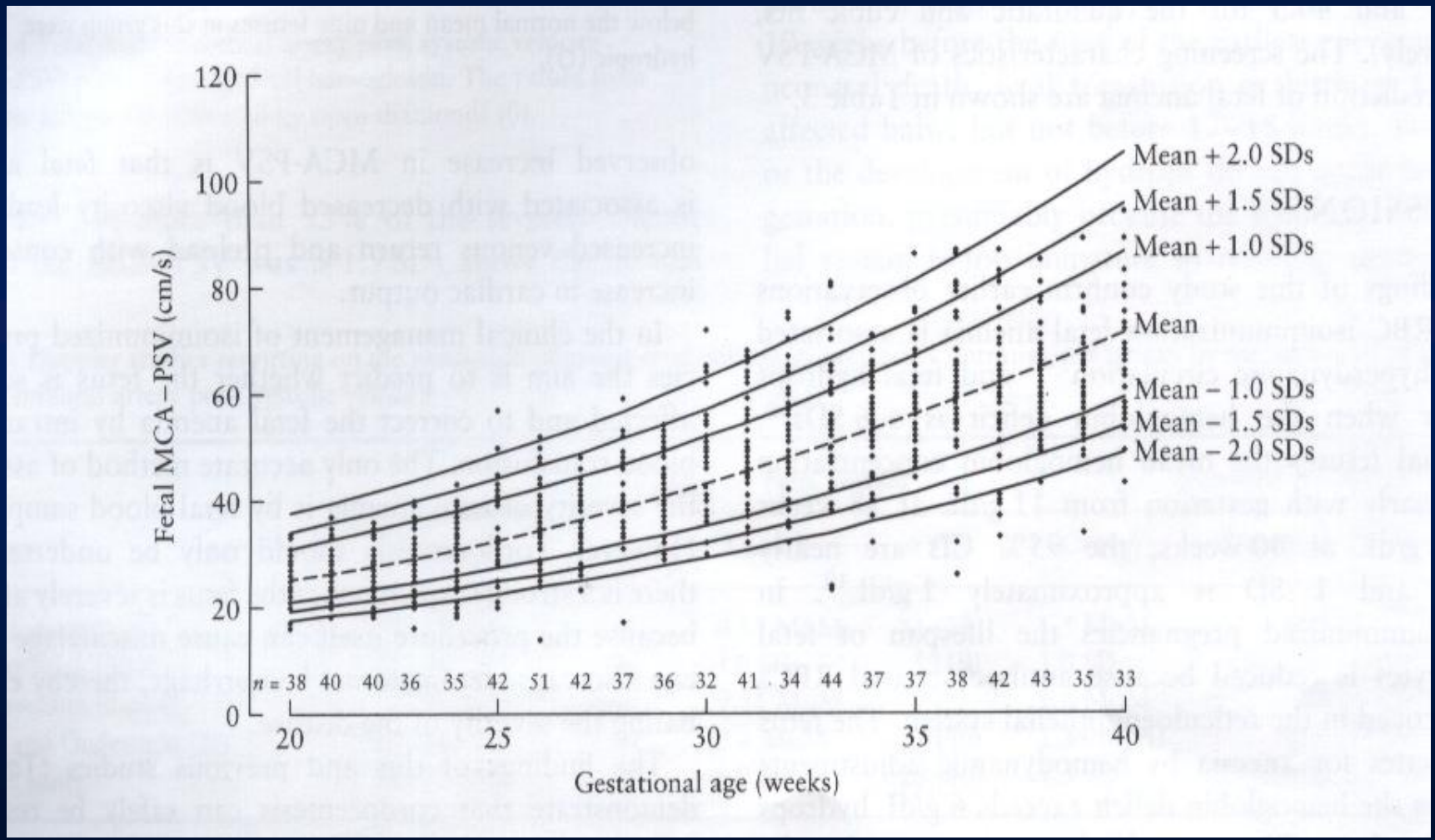
- Middle cerebral artery peak systolic velocity
- Ultrasound features of foetal anaemia
- Hydrops foetalis

Middle cerebral artery

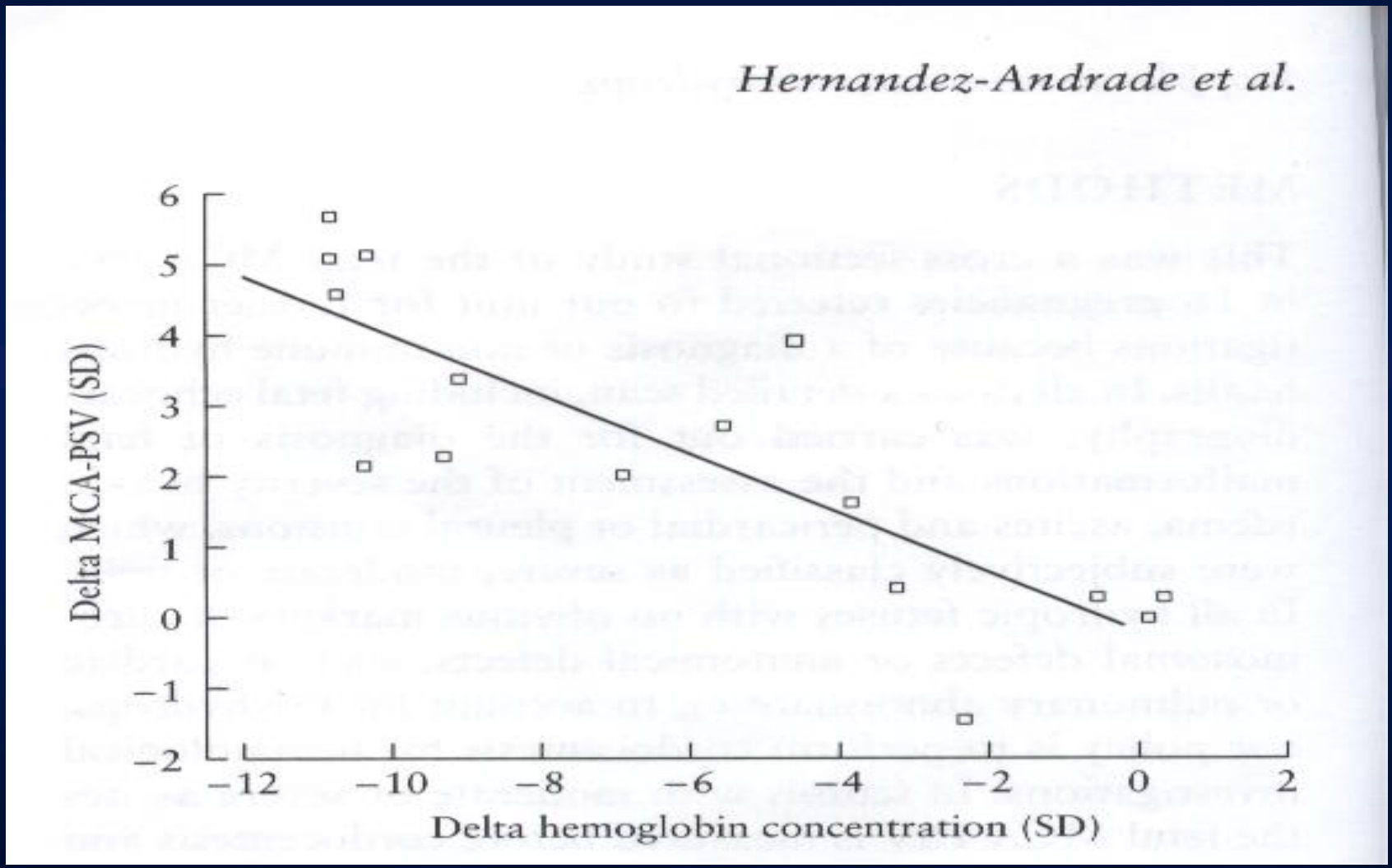
- Anaemic foetuses have higher velocities
- Always correct angle of insonation
- Use gestational age charts
- Sensitivity 96%, false positive rate14%.

- *Scheier M et al,, ultraounsd obstet Gynecol 2004:23:432-436*

Middle cerebral artery distribution in pregnancy



Foetal haemoglobin in rhesus disease



Cordocentesis

- Usually at cord insertion
- At 20 weeks or more
- Transplacental or transamniotic
- Foetal loss rate 5-10%
- Repeat in 10 days if anaemic due to antibody flare up.

Changes following transfusion

- Intrauterine transfusion is associated with a significant decrease in the peak velocity in the middle cerebral artery and this decrease is proportional to the increase in fetal hematocrit. These findings are likely to be the result of a decrease in cardiac output following the transfusion due to:
- (1) Increased blood hemoglobin concentration and viscosity, and consequent decrease in venous return;
- (2) Congestive heart failure due to overloading of the fetal circulation; or
- (3) Cardio-inhibition due to increased baroreceptor activity.

Future pregnancies

- Immune causes are followed up down same lines
- Congenital infections have no effect on future pregnancies
- Feto-maternal haemorrhage is usually a non recurrent effect
- Genetic testing for parents carriers of haemoglobinopathies

Summary

- Ultrasound and use of Doppler assessment can help predict the cases that are anaemic early before hydrops develops with low false positive rate.
- In addition it helps to follow up those cases to decide timing for follow up transfusion.

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Further Information

- www.fetalmedicine.com
- www.thefetus.com
- www.omnim.com
- http://www.ncbi.nlm.nih.gov/Omim/searchomim.html
- www.prenataldiagnosis.com