NONIMMUNE HYDROPS FETALIS

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INTRODUCTION

Hydrops fetalis

Two or more

- **Ascites**
- **Pleural effusion**
- **Pericardial effusion**
- **Skin oedema**
- **Polyhydramnios**

Widespread use Rh (D) immune globulin

↓ Prevalence of Rh (D) alloimmunization

Now NIHF > immune-mediated hydrops

90% of hydrops cases

Incidence 1/1500 – 1/3800 births

PATHOGENESIS

NIHF end result of one or more abnormalities

- **Obstructed lymphatic drainage (thoracic/ abdominal neoplasm)**
- **↑ capillary permeability (infection)**
- **↑ venous pressure (miocardial failure/obstructed venous return)**
- **↓ osmatic pressure (liver disease/nephropathy)**
- **Anaemia (↑ cardiac output → ↑ venous pressure)**
- **Hypoproteinaemia**

CLINICAL

MATERNAL:

- **Uterus large for dates**
- **↓ fetal movement**
- **Theca lutein cysts**
- **Preeclampsia**
- **Anaemia**
- **Preterm labor / delivery**
- **Birth trauma**
- **Retained placenta**
- **Postpartum haemorrhage**

MIRROR SYNDROME (BALLANTYNES SYNDROME)

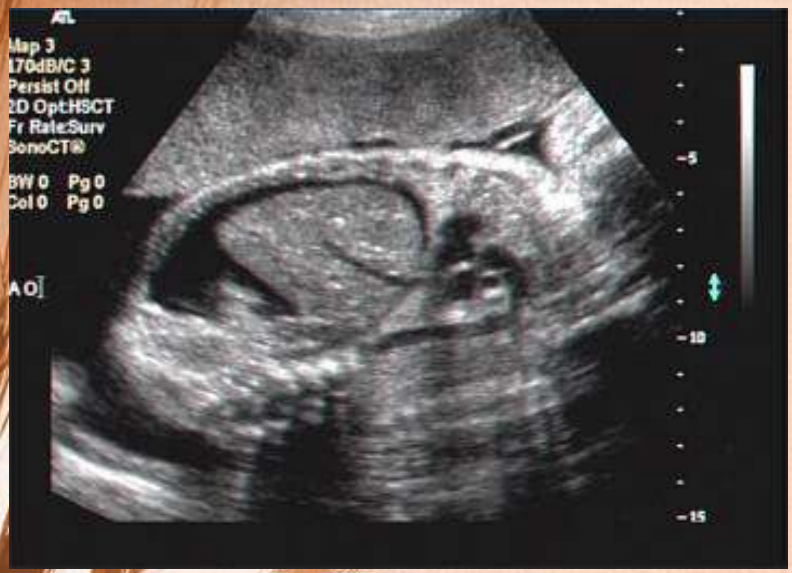
- **Generalized maternal oedema**
- **Often pulmonary involvement (mirrors the oedema of the hydropic fetus + placenta)**
- **Hypothesis: hydropic placenta causes a systemic inflammatory response as a result of increased shedding of throphoblastic debris into maternal blood**
- **In contrast to preeclampsia, hematocrit often low haemodilution rather than haemoconcentration**
- **Polyhydramnios vs oligohydramnios**
- **Always fetal signs of hydrops**

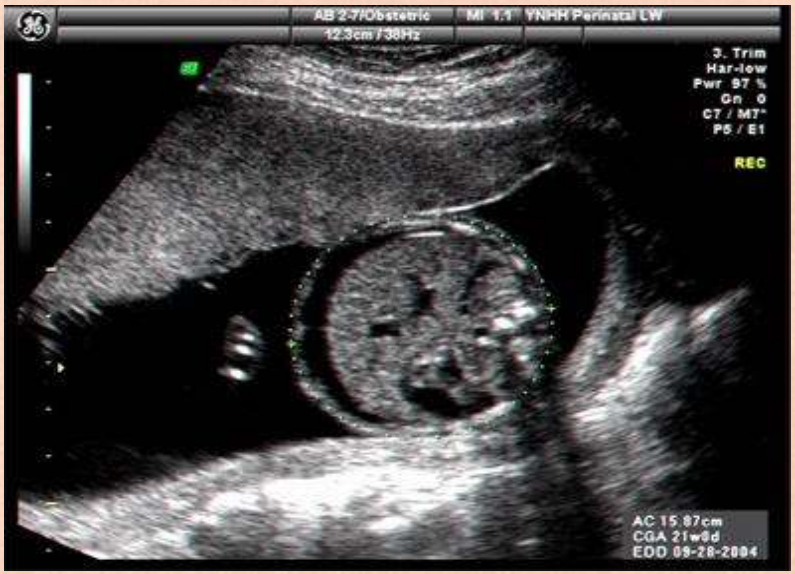
FETUS

- **Diagnosis established by ultrasound examination**
- **An attempt to determine etiology should be made at time of diagnosis**
- **Several etiologies confirmed / excluded based upon ultrasound findings (eg. TTTS, cardiac arrhythmias, structural anomalies)**

ASCITIES

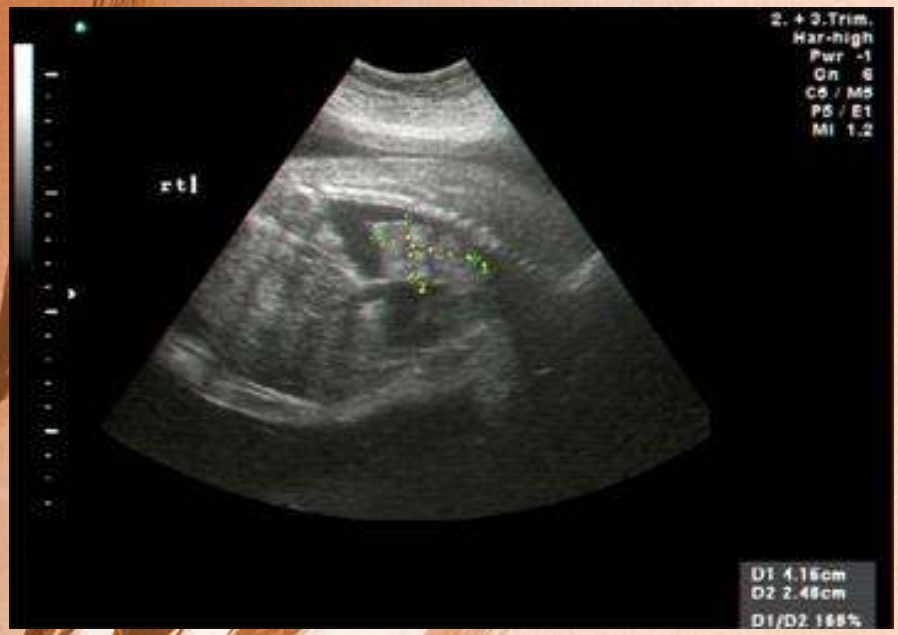
- **Early sign**
- **Outlining of intraabdominal organs by thin rim of fluid**

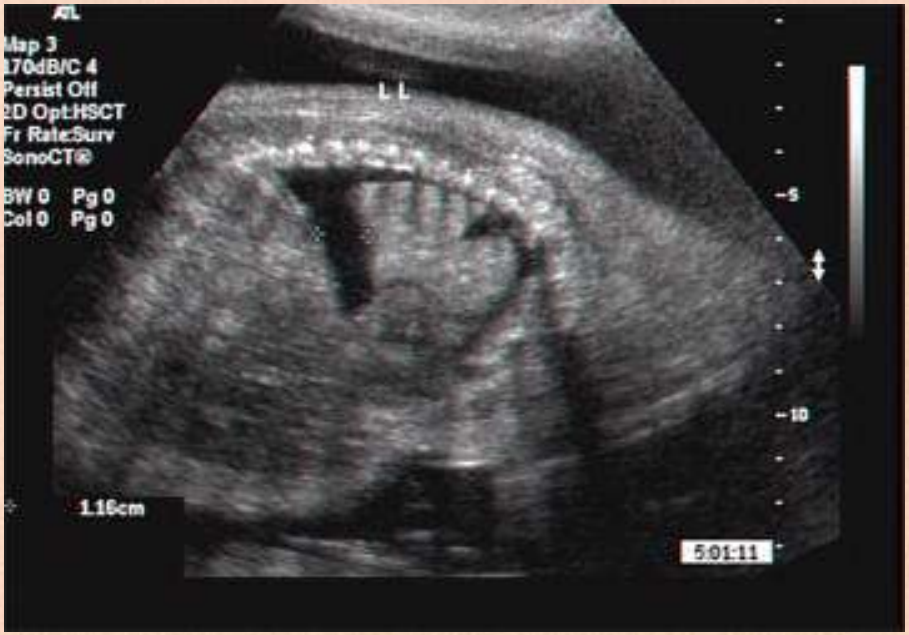




PLEURAL EFFUSIONS

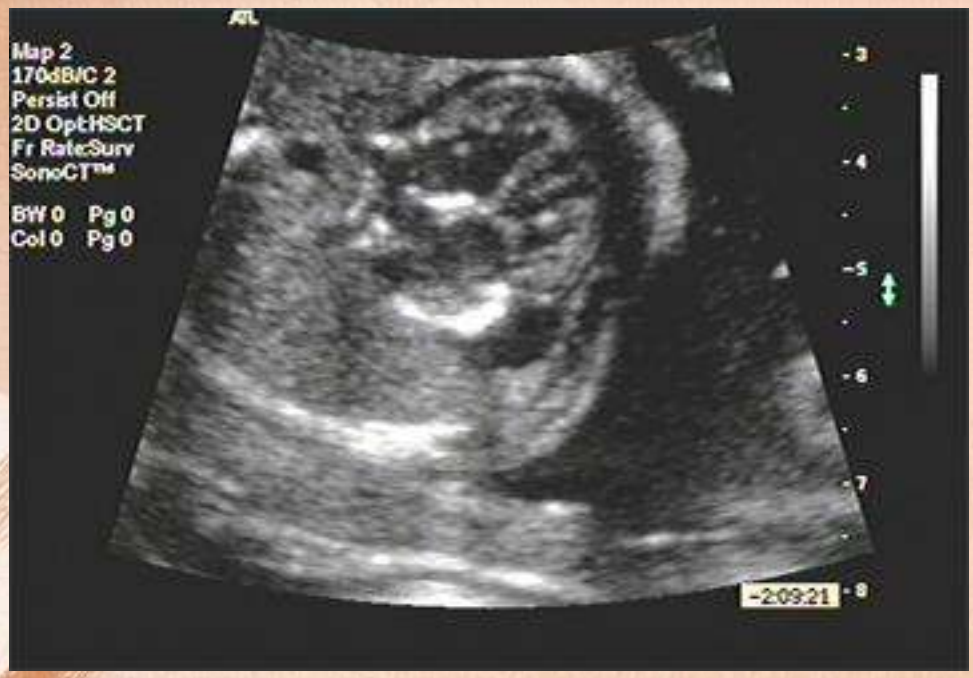
- **Fluid outlining the lungs, just inside the chest wall unilateral / bilateral**





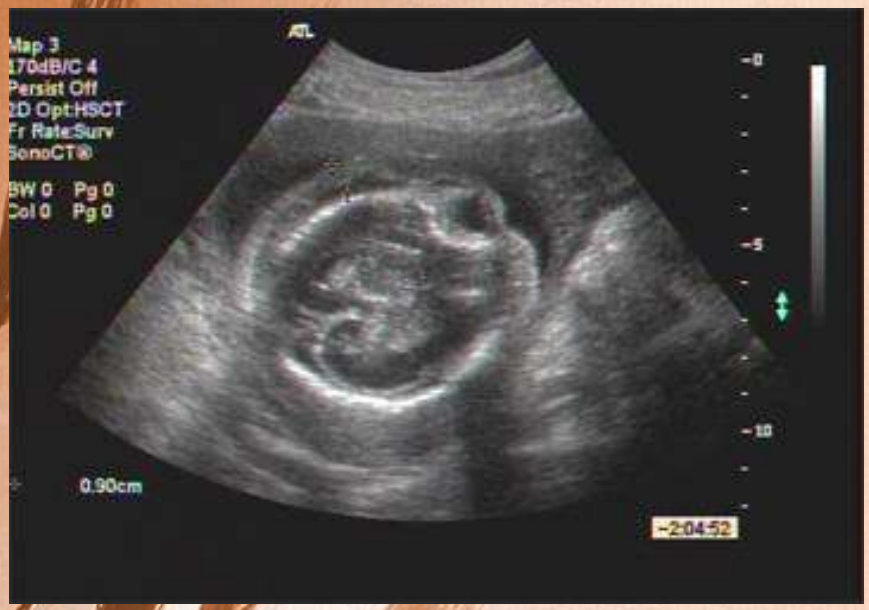
PERICARDIAL EFFUSIONS

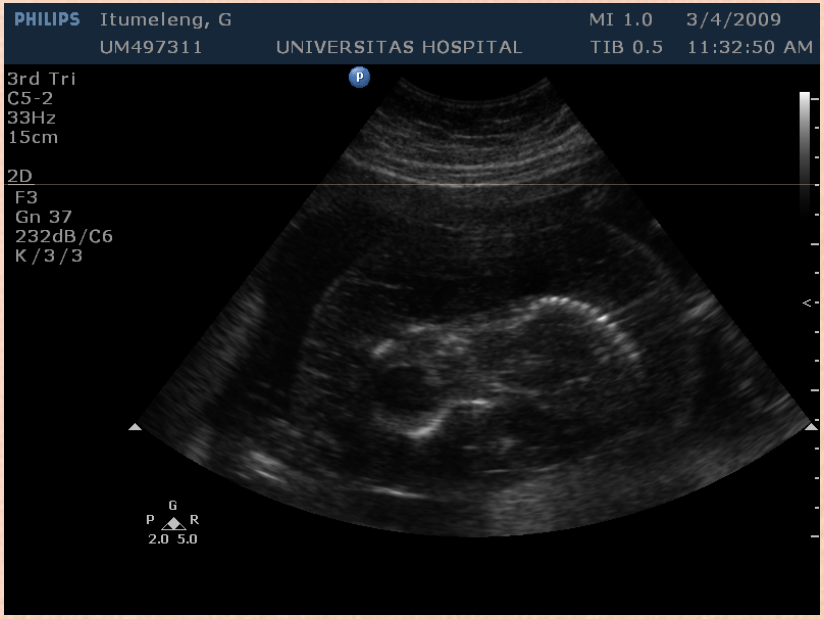
- **Pericardial fluid up to 2mm (2nd trimester) is common, not pathologic**



SKIN OEDEMA

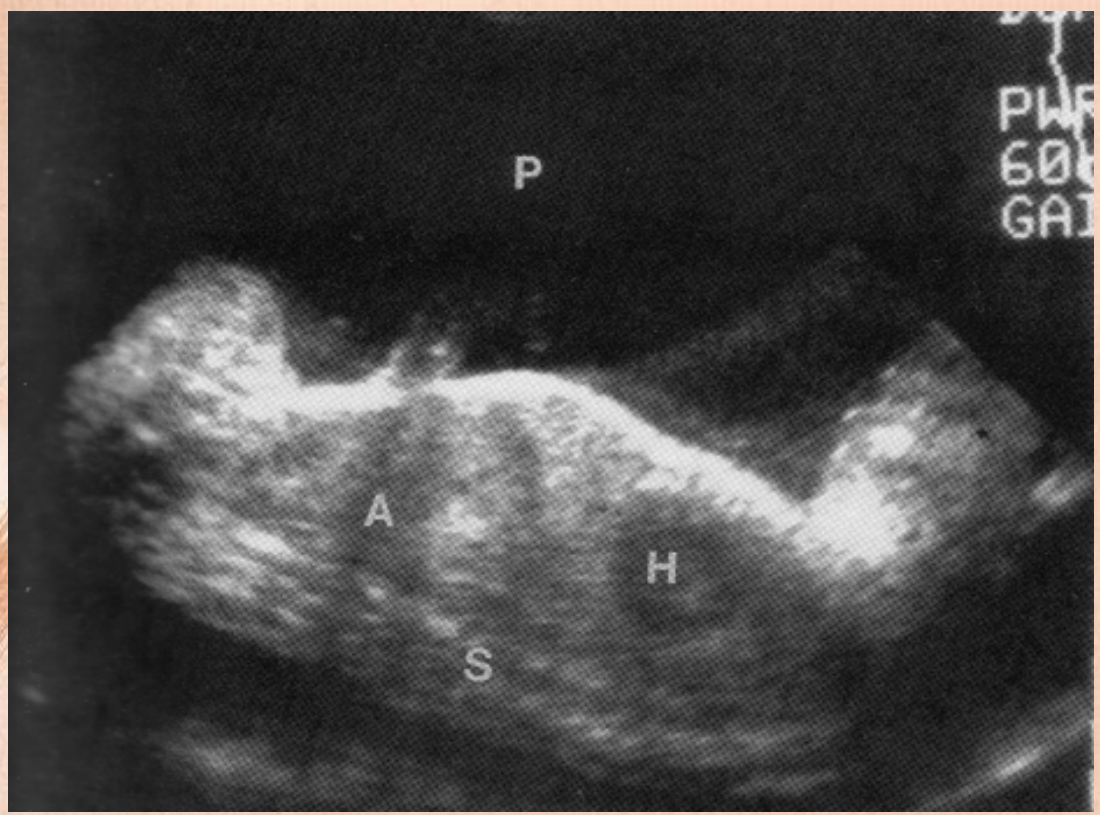
- **Late sign of hydrops**
- **Chest/scalp > 5mm (exclude fat – macrosomic fetus)**





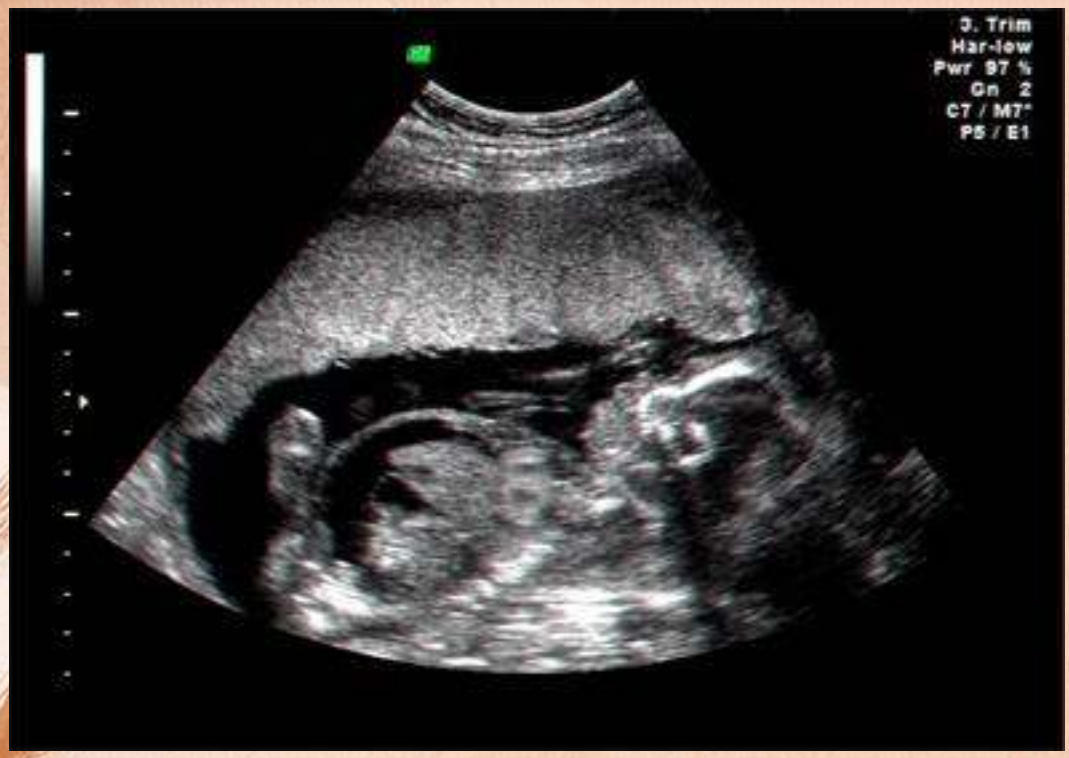
POLYHYDRAMNIOS

- **AFI > 24 cm or a maximum vertical pocket > 8 cm**



PLACENTOMEGALY

- **Intravillous oedema**
- **Thickness > 4 – 6 cm - abnormal**



DISORDERS ASSOCIATED WITH HYDROPS

- **Cause can be determined antenatally in 50 – 85% of cases**
- **5 – 8% idiopathic even after autopsy**
- **Proportion of hydrops cases attributable to each category depends on gestational age at presentation eg. NIHF < 24 weeks - usually aneuploidy > 24 weeks – cardiac, pulmonary, infections**

GENETIC CAUSES

- **Most common: aneuploidy, Turner's syndrome, trisomy 21**
- **Aneuploidy – 10% of NIHF**
- **Monosomy X – 42 – 67% of cases**
- **Trisomy 21 – 23 – 30%**
- **Trisomy 13, 18, 12 – 10%**
- **Mechanism – obstruction/incomplete formation of lymphatic system in the neck (cystic hygroma) or abdomen leading to lymphatic dysplasia**
- **Another mechanism – cardiac failure (congenital heart disaese) 15 – 25% of aneuploid fetusses**

- **Poor prognosis – mortality rate approaching 100%**
- **Management depend on specific chromosomal anomaly and whether there is coexistent heart disease**
- **Nonlethal aneuploidies – fetal maternal surveillance for signs of decompensation → possible early delivery**

METABOLIC STORAGE DISEASES

- **1 – 15% of cases of NIHF**
- **Lack of specific enzymes necessary to process metabolites in organs such as brain, heart, liver, kidney**
- **No specific therapy antenatally**
- **Usually in utero-death**
- **Risk of recurrence as high as 1 in 4**

CARDIOVASCULAR ABNORMALITIES

- **40% of cases of NIHF**
- **3 major subgroups:**
  - **Structural anomalies – AVSD, hypoplastic left heart**
  - **Arrhythmias – tachyarrhythmias and bradyarrhythmias**
  - **Vascular abnormalities**
    - **Arteriovenous and venous malformations**
    - **Chorioangiomas > 4 – 5 cm → NIHF**

CARDIOVASCULAR ABNORMALITIES

Management:

Intrauterine endoscopic laser coagulation of the feeding vessels

- **some success**
- **complications eg. fetal bleeding**

AV fistulas in other areas:

- **Sacrococcygeal teratoma**
- **Neuroblastoma**
- **Hemangiomas**
- **Umbilical cord aneurisms**

THORACIC ABNORMALITIES

- **Up to 10% of NIHF**
- **↑ intrathoracic pressure:**
  - **obstruct venous return to the heart**
  - **obstruct lymphatic duct**
- **Fetal pleural effusions isolated or associated with hydrops**
- **With hydrops – prognosis worse**
- **Can be related to:**
  - **aneuploidy**
  - **structural malformations**
  - **tumors**
  - **congenital infection**
  - **genetic syndromes (eg. Noonan)**

THORACIC ABNORMALITIES

Management:

Placement of a pleuroamniotic shunt

- **↓ risk of lung hypoplasia**
- **↓ venous + lymphatic obstruction → resolve hydrops**

Needle aspiration – not recommended, reaccumulate within 48 hours

ANAEMIA

10 – 27% of hydrops

<u>Etiology</u>:

- **haemorrhage, hemolysis, defective red blood cell production**
- **leading to high output cardiac failure**

<u>Management:</u>

Intrauterine transfusion

Aggressive therapy – prognosis good

INFECTIOUS DISEASES

8% of NIHF

Parvovirus B19 most common

TORCH pathogens (toxoplasmosis, rubella, CMV, herpes virus)

Other: - syphilis, varicella, adeno-, coxsackie virus

- leptospirosis, listeria

- **Pathogenesis not well understood except for Parvovirus B19**
- **Virus attacks red blood cells, hepatocytes, myocardial cells**
- **Causing aplastic crisis, hepatitis, myocarditis**
- **Self-limited - prognosis good if fetus is supported by intrauterine transfusions**
- **TORCH - multisystem failure (heart failure, hypoalbuminemia) - poor prognosis**
- **Therapy is directed against the infectious agent**

GASTROINTESTINAL MALFORMATIONS AND GENITOURINARY MALFORMATIONS

- **Small proportion of NIHF**
- **Prognosis depend on karyotype and specific malformation**

TTTS

- **Covered in separate lecture**

EVALUATION

- **Thorough search for etiology**
- **? Potentially treatable**
- **Disorders with risk for recurrence**

<u>Components:</u>

- **Detailed history (ethnic background, heritable disorders)**
- **Exposure to infectious agents**
- **Detailed ultrasound**
- **Doppler MCA, PSV (peak systolic velocity)**

Laboratory tests:

***Maternal*:**

- **FBC**
- **Blood type + antibody screen**
- **Serologies (IgM + IgG)**
- **Kleihauer-Betke**

Fetal:

- **Karyotype**
- **PCR for TORCH**
- **Fetal blood - Hb**

PROGNOSIS AND MANAGEMENT

- **NIHF associated 50 – 98% perinatal mortality rate**
- **Prognosis depend on:**
  - **Etiology**
  - **Gestational age at onset**
  - **+/- pleural effusions**
- **Earlier – poorer prognosis**
- **Pleural effusions + polyhydramnios < 20 w $\rightarrow$ poor prognosis**
- **Management options include:**
  - **Termination**
  - **Therapeutic intervention when possible**
  - **Supportive care / monitoring**

Antenatal surveillance:

- **Non-stress testing +/- biophysical profile**
- **Delivery when fetal/maternal decompensation**
- **Doppler MSA only useful in fetal anaemia**
- **Delivery at tertiary care center with a neonatal ICU**

Recurrence risk:

- **? Etiology**
- **Every effort to determine cause**

SUMMARY

- **Hydrops fetalis is defined as the presence of two or more of the following abnormal fetal fluid collections: skin oedema, pleural effusion, pericardial effusion, ascites, polyhydramnios. It may be caused by immune or nonimmune mediated processes.**
- **Women carrying a hydropic fetus may have uterine size large for dates, they may notice decreased fetal movement, and they may develop generalized oedema with or without preeclampsia (ie. mirror syndrome).**
- **The prenatal diagnosis of hydrops fetalis is established by ultrasound examination. An attempt to determine the etiology of the hydrops should be made at the time of diagnosis, since several etiologies are confirmed or excluded based upon ultrasound findings.**

- **The causes of nonimmune hydrops are heterogeneous and include aneuploidy, structural abnormalities, metabolic disorders, anemia, and infection.**

- **It is important to determine whether a potentially treatable cause of hydrops is present, and to identify disorders with a risk of recurrence in future pregnancies.**

- **Evaluation of these pregnancies includes:**
  - **A detailed history to look for heritable disorders and exposure.**
  - **A detailed fetal sonogram, echocardiography and Doppler velocimetry to look for anatomic, cardiac, and anaemia-related causes of hydrops.**
  - **Laboratory evaluation such as red blood cell antibody screen, mean corpuscular volume, Kleihauer-Betke and appropriate tests to look for infection.**

- **The presence of hydrops is a poor prognostic indicator for perinatal survival.**
- **The management and intervention are dictated by the underlying disease process.**
- **Maternal-fetal medicine specialists and neonatologists should be involved in the management of these pregnancies.**


Thank you