Membranes - Acute necrotizing chorioamnionitis
Membranes - Acute necrotizing chorioamnionitis
Chorionic plate
Umbilical phlebitis

Umbilical arteritis
**Fusobacterium nucleatum**

Common oral pathogen associated with periodontal disease. Pregnancy associated gingivitis common. Route of transmission: blood (proven in mice) from mother or orogenital (only 1 documented case). Ascending vaginal unlikely.

Gross: Common to have yellow-green opacification of amnion. Culture important to prove speciation (not routinely done with placentas).

Microscopic:
Usually high stage inflammation. Amnion usually necrotic. Poorly staining gram negative rod. Best seen with giemsa, GMS, or Warthin-Starry. Long slender rods usually in amnion and perpendicular to surface.

Clinically:
Results in acute chorioamnionitis and preterm premature rupture of membranes. Fetal sepsis and stillbirth are rare.

Take home points –

1. AFI rarely causes death in term fetus (look for fetal sepsis).

2. AFI in preterm pregnancies is a common cause for PPROM. Immature fetal organs source of pathologic sequelae.

3. The pathology report should describe the extent/location of both the maternal and fetal inflammatory responses but does not have to explicitly state the stage.

4. Look for acute and chronic processes, always try to establish the cause for a small placenta - not due to AFI.

5. Document meconium if present.

6. Maternal inflammatory response can increase risk of acute marginal hemorrhage (abruption).
MATERNAL VASCULAR UNDERPERFUSION
MATERNAL VASCULAR UNDERPERFUSION

Disease states resulting in decreased maternal blood flow to the placenta.

Look at maternal (decidual) vessels.
Maternal Vascular Underperfusion
(Maternal vascular occlusion; placental malperfusion)

Associated with numerous systemic maternal diseases:

- Severe heart disease
- Diabetes mellitus
- Hypertension (chronic, PIH, preeclampsia)
- Thrombophilias (Factor V Leiden mutation, antithrombin III deficiency, protein C or S deficiency, others)
- Autoimmune disorders (SLE, others)
- Antiphospholipid antibody syndrome
- Chronic renal failure
- Abnormal uterine vasculature
Maternal Vascular Underperfusion – Preeclampsia

Preeclampsia –

1) increased blood pressure associated with pregnancy (7-10% primigravidas)
2) proteinuria
3) edema

Eclampsia

Above + seizures

Pregnancy induced HTN (PIH)

No proteinuria or edema (gestational hypertension)

HELLP

Hemolysis, Elevated Liver enzymes, Low Platelets,

Failure of remodeling of maternal spiral arteries by EVT.

From: Redman C & Sargent I Placenta 30:38-42, 2009
Diagnostic criteria:

From: Redline RW et al.
Ped Devel Pathol

Small Placenta (<10%)

Vascular
Atherosis
Fibrinoid necrosis
Thrombosis
Muscularization of arterioles

Villous changes
Increased syncytial knots
Distal villous hypoplasia
Infarcts
Villous agglutination
Increased fibrin

| Table 1. Placenta reaction patterns related to maternal vascular underperfusion: nomenclature and definitions |
|---|---|
| Diagnostic terminology | Definition |
| Intervillous space | |
| Increased syncytial knots | Aggregates of syncytiotrophoblast nuclei along stem villi or at one or more poles of distal villi |
| Mild-moderate | Excessive for gestational age in ≤ 30% of parenchyma |
| Severe | Excessive for gestational age in > 30% of parenchyma |
| Villous agglutination | Clusters of adherent distal villi (> 2, < 20) agglutinated by fibrin(oid) and/or bridging syncytiotrophoblast knots accompanied by stromal fibrosis, cellular degeneration, or karyorrhexis |
| Increased intervillous fibrin | Abnormal amounts of intervillous fibrin(oid) either coat proximal stem villi (Langhan stria) or are eccentrically adherent to (or within, following reepithelialization) distal villi |
| Distal villous hypoplasia | Modal diameter of distal villi is decreased. Number of distal villi decreased relative to the number of stem villi. Stem villi either have muscularized vessels or dense fibrotic cores (> 30% of parenchyma affect ed) |
| Arterial wall and implantation site | Red-blue glassy degeneration (fibrinoid necrosis) of arterial smooth muscle plus subendothelial or medial foam cells (macrophages) in muscularized maternal arteries of basal plate, marginal zone, and/or membranous decidua |
| Acute atherosis, decidual arteries | |
| Mural hypertrophy, membrane arterioles | Thickening (mean wall diameter > 30% of mean circumference) of maternal arterioles in the decidua parietalis due to any combination of medial or subendothelial hyperplasia, hypertrophy, and interstitial matrix deposition |
| Muscularization, basal plate arteries | |
| Increased placental site giant cells, decidua basalis | Persistence of smooth muscle cells in the wall of a large spiral artery in the basal plate (includes by definition basal plate acute atherosis—see text) |
| Immature intermediate trophoblast, decidua basalis | Numerous trophoblastic giant cells (three or more nuclei) in the deep basal plate (near plane of separation from uterus) of the basal plate surrounded by loose decidual tissue without accompanying intermediate trophoblast or fibrinoid |
| Other | |
| Thin umbilical cord | Tightly cohesive groups of 10-20 (or more) eosinophilic and/or vacuolated immature intermediate trophoblast arranged in sheets or clusters in the superficial basal plate (near anchoring villi). Adjacent fibrin(oid) is often excessive and may show cystic degeneration and lamination |
| | No completely sampled representative umbilical cord segment has a maximum cross-sectional diameter of > 8.0 |
Decidual Vasculopathy

Thrombus and fibrinoid necrosis
Acute atherosis membrane arterioles
Mural hypertrophy of membrane arterioles
Pathologic if lumen is <50% total diameter
Unremodeled basal plate arterioles. Persistent muscularization of basal plate arteries. Any smooth muscle around basal plate arteries is pathologic.
Distal villous hypoplasia and increased syncytial knots at 26 weeks
BP with increased placental site giant cells (cluster of giant cells >3 nuclei)
Nonspecific
Multiple infarcts >50% of parenchyma
Infarcts
Vascular Disruption
Abruption with Vaginal Hemorrhage

From Dr. DB Singer
Clinical implications (adverse outcomes) associated with MVU:

**FETUS**
Stillbirth
Small placenta,
SGA
Preterm labor and delivery
Abruption
Poor neurologic outcomes due hypoxic/ischemic injury

**MOTHER (from preeclampsia/eclampsia)**
Hemorrhage (abruption)
DIC
Acute renal failure
Pulmonary edema
Liver failure
Stroke
Death
FINDINGS CONSISTENT WITH MATERNAL VASCULAR UNDERPERFUSION

VASCULAR LESIONS:
  ACUTE ATHEROSIS OR FIBRINOID NECROSIS OF BASAL OR PARIETAL ARTERIOLES.
  PERSISTENT MUSCULARIZATION OF BASAL PLATE ARTERIES.
  MURAL HYPERTROPHY OF MEMBRANE ARTERIOLES.

VILLOUS CHANGES:
  VILLOUS INFARCTS, AGE, SIZE, NUMBER, % PARENCHYMA
  INCREASED SYNCYTIAL KNOTS (TENNEY-PARKER CHANGE).
  VILLOUS AGGLUTINATION.
  INCREASED PERIVILLOUS FIBRIN.
  DISTAL VILLOUS HYPOPLASIA.

  USUALLY IN THE SETTING OF A SMALL PLACENTA (<10%)

The histologic findings do not distinguish between the possible clinical diseases (they are not disease specific):
thrombophilia vs. autoimmune vs. chronic HTN vs. preeclampsia.
Take home points –

1. Small placenta – look for maternal underperfusion. There are other causes!

2. Decidual vasculopathy is best assessed in membranes. Beware of fibrinoid layers in decidua basalis.

3. Criteria for decidual (maternal) vasculopathy:
   a. End-organ injury (infarcts +/- acute inflammation and fibrin), Tenney-Parker change due to ischemia
   b. Maternal vessel injury (fibrinoid necrosis, thrombi, atherosis)
   c. Associated hemorrhages (retroplacental, subchorionic, marginal)

4. Look for corroborating clinical history (HTN, preeclampsia, autoimmune, thrombophilias).
FETAL VASCULAR OBSTRUCTION/FETAL THROMBOTIC VASCULOPATHY
FETAL VASCULAR OBSTRUCTION

Thrombotic processes involving the fetal circulation.

Look at the fetal vessels at the CP and within villi.
Fetal vascular obstructive lesions
(restriction of umbilical blood flow)

Most severe form referred to as Fetal Thrombotic Vasculopathy (FTV).

Causes:
Infections (acute chorioamnionitis), umbilical cord accidents, fetal/maternal thrombophilias (?), meconium myonecrosis, polycythemia, fetal heart failure, obliterative fetal vasculopathy (syphilis and VUE), unknown, others.

Care must be taken in stillbirths with prolonged IUFD – histologic overlap.

Findings consistent with Fetal Vascular Obstruction:
Frequently see some changes suggestive of restriction of fetal blood flow or thrombi, but the histologic changes do not meet “threshold” criteria for diagnosing FTV.
Diagnostic criteria:

From: Redline RW et al.  

Vascular lesions:
- Thrombi CP/stem vessels
- Intimal mural fibrin thrombi (endothelial cushions)
- Recanalized lumens +/- early thrombosis

Villous changes:
- Villous stromal-vascular karyorrhexis
- Avascular villi

<table>
<thead>
<tr>
<th>Diagnostic terminology</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Distal villous lesions</td>
<td>Uniformly avascular villi</td>
</tr>
<tr>
<td>Villous stromal-vascular karyorrhexis</td>
<td>Three or more foci of two or more terminal villi showing total loss of villous capillaries and bland hyaline fibrosis of the villous stroma in a distribution consistent with obstructed flow in large supplying or draining vessels. A small amount of karyorrhectic debris is allowable</td>
</tr>
<tr>
<td>VUE with obliterator fetoplacental vasculopathy</td>
<td>VUE extending to stem villi associated with stem villous vasculitis, vascular occlusion, and loss of vessels in the downstream distal villous tree</td>
</tr>
<tr>
<td>Large fetal vessel lesions</td>
<td>Thrombosis</td>
</tr>
<tr>
<td>Intimal fibrin cushion</td>
<td>Recent</td>
</tr>
<tr>
<td></td>
<td>Remote</td>
</tr>
<tr>
<td>Villous changes consistent with chronic fetal vascular obstruction</td>
<td></td>
</tr>
</tbody>
</table>

Any
- Uniformly avascular villi or villous stromal-vascular karyorrhexis (more than two foci) ± fetal vessel lesions

Severe
- Uniformly avascular villi or villous stromal-vascular karyorrhexis (more than two foci/average of 15 or more affected villi/slide) ± fetal vessel lesions

NRBC, nucleated red blood cells; RBC, red blood cells; VUE, villitis of unknown etiology.
Fetal Vascular Obstruction/Fetal Thrombotic Vasculopathy

CP thrombi and vascular injury