Pathology of Gestation: Fallopian Tube, Trophoblast, and Placenta

Richard W. Lieberman, MD, FACOG, FCAP
University of Michigan Health System
Departments of Anatomic Pathology and Obstetrics & Gynecology
Pathology Associated with Gestation

- Early pregnancy
  - implantation associated

- Late Pregnancy
  - structural variation
  - implantation associated
  - pathology associated with high risk pregnancy

- Gestational Trophoblastic Disease
Early Gestation: Implantation

Associated Pathology

transmigration

implantation

decidua

fertilization
Early Conceptus
Intermediate Trophoblast – Invasion of spiral arterioles
10-12 Weeks Gestation
Early Gestation: Implantation Associated Pathology

- Spontaneous Abortion
  - implantation site failure

- Ectopic Pregnancy
  - abnormal location
Spontaneous Abortion

- **Incidence**
  - ~20% (more?)

- **Fetal Factors**
  - chromosomal anomaly

- **Maternal Factors**
  - multifactorial
    - endocrine, immunologic, uterine defect, etc.

- **Idiopathic**
Ectopic Pregnancy

- **Risk Factors**
  - tubal surgery
  - salpingitis (PID)

- **Diagnosis**
  - Laboratory
    - serial quantitative $\beta$-hCG
  - Ultrasound Examination
  - Laparoscopy

Combined ovarian & tubal pregnancy
Ectopic (tubal) pregnancy
Ectopic – Infiltration of Wall
Ectopic Pregnancy – Sites of Occurrence

- **Ampulla**: 80%
- **Isthmus**: 10%
- **Cornua**: 1%
- **Fimbria**: 5%
- **Ovary**: 2%
- **Cervix**: <1%
- **Abdomen**: <1%

Ectopic Pregnancy

decidual cast
Pathology of Late Pregnancy

- **Important Clinical Associations**
  - Intrauterine growth retardation
  - Intrauterine or perinatal death
  - Congenital anomalies
  - Maternal and neonatal morbidity

*The placental manifestation is often non-specific; an end product of the maternal-fetal pathology.*
Placental Abnormalities — Overview

- Structural Variations of the Placenta
  - membrane
  - cord
  - anomalies of the placental disc
- Aberrant Implantation Location
- Inflammatory and Infectious Disease
Single Umbilical Artery

- Increased in multifetal gestations
  - 0.85% of singletons
  - 5% of at least one twin
- ~30% with associated congenital anomalies
  - renal
  - cardiac
Placental Variations

- **Abnormal Shapes**
  - lobar variations
    - number, shape
  - cord implantation
    - location on disc
    - membranous implant
  - membrane anomalies
    - circumvallate
    - amnionic bands
Aberrant Implantation

- **Ectopic Pregnancy**
  - already discussed

- **Placenta Previa**
  - completely or partially covering the cervix

- **Placenta Accreta**
  - absence of Nitabuch’s layer (fibrinoid)
    - myometrial implantation
  - types
    - accreta - superficial
    - increta - deep
    - percreta
      - full thickness myometrial penetration

_All carry the risk of significant maternal hemorrhage_
Placenta Previa

Complete Previa

Partial Previa

-from Netter
Placenta Accreta

H&E

Trichrome
Multiple Gestations
Twin Gestation – Zygosity

- **Dichorionic-Diamnionic**
  - 70% dizygotic
  - 30% monozygotic
    - split ≈ day 3

- **Monochorionic-Diamnionic**
  - 100% monozygotic
    - split day ≈ 4-8

- **Monochorionic-Monoamnionic**
  - split ≈ day 8
    - amnion formation completed
  - HIGH risk
    - fetal death
    - fetal malformations
  - Conjoined “Siamese”
    - split ≈ day 10-12
PLACENTAS IN MULTIPLE PREGNANCIES

DICHOРИONIC TWINS*

SEPARATE

FUSED

*Monozygous or dizygous twins
Placentation in Multiple Gestations

Dichorionic Diamnionic
-- two implantation sites
-- two placentas

Monochrionic Diamnionic
-- one implantation site, then conceptus splits
Twin-Twin Transfusion Syndrome
Monoamnionic Twin Gestation
Perinatal Morbidity: Associated Abnormalities Overview

- inflammatory, infectious diseases
- meconium staining
- placental infarction & hemorrhage
Inflammatory & Infectious Disease

- **Inflammatory**
  - chorioamnionitis
    - deciduitis - early
    - chorion + amnion - late
    - funisitis
      - umbilical cord
  - villitis

- **Infectious**
  - etiologies
    - TORCH
    - group B Strep
    - vaginal pathogens
  - pathways
    - hematogenous
    - PROM
Chorioamnionitis
Chronic Villitis

TORCH: Here a CMV Cowdry-type inclusion
Meconium Staining
Meconium Staining

- **Fetal Distress**
  - medicolegal association
- **Multiple etiologies**
  - fetal distress
  - anomalies
  - post-dates
  - unknown
Hypertensive Disorders of Pregnancy — Intervillous Thrombosis and Hemorrhage
Fibrinoid Necrosis of Maternal Decidual Vasculature

The hallmark lesion of pre-eclampsia
Placental Abruption & Infarction

Thrombosis

Infarction
Gestational Trophoblastic Disease

Neoplastic Proliferations
Of Trophoblastic Tissue
Trophoblast

- Cytotrophoblast
- Syncitiotrophoblast
  - $\beta$-hCG
- Intermediate Trophoblast
  - implantation site
WHO Classification of Gestational Trophoblastic Neoplasms

- Hydatidiform Mole
  - Complete
    - Invasive Mole
      - (chorioadenoma distruens)
    - Persistent Mole — GTN*
  - Partial Mole

- Gestational Choriocarcinoma

*GTN = gestational trophoblastic neoplasia
Hydatidiform Mole - Complete
Complete Mole

Microscopic Features

Triad

- Hydropic change
  - uniformly large villi
  - central cisternae
- avascular villi
- circumferential trophoblastic proliferation
Complete Mole — Avascular Villi
# Molar Gestations

<table>
<thead>
<tr>
<th>Features</th>
<th>Partial Mole</th>
<th>Complete Mole</th>
</tr>
</thead>
<tbody>
<tr>
<td>fetal tissue</td>
<td>present</td>
<td>absent</td>
</tr>
<tr>
<td>serum beta-hCG</td>
<td>low-to-increased</td>
<td>marked increase</td>
</tr>
<tr>
<td>karyotype</td>
<td>triploid (m&amp;p)</td>
<td>diploid (p) - 46XX (96%)</td>
</tr>
<tr>
<td>GTN risk</td>
<td>&lt;5%</td>
<td>~20%</td>
</tr>
<tr>
<td>Choriocarcinoma</td>
<td>(choriocarcinoma rare)</td>
<td>2%</td>
</tr>
</tbody>
</table>
Complete Mole — Proposed Origins

Empty Egg — 23X

46XX

46XX — Paternal Chromosomes
Only
Diandry
Choriocarcinoma

<table>
<thead>
<tr>
<th>Gestational Choriocarcinoma</th>
<th>Non-gestational Choriocarcinoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>- <em>always</em> associated with an antecedent gestation</td>
<td></td>
</tr>
<tr>
<td>- normal gestation</td>
<td></td>
</tr>
<tr>
<td>- spontaneous AB</td>
<td></td>
</tr>
<tr>
<td>- molar gestation</td>
<td></td>
</tr>
<tr>
<td>- Germ Cell Tumor</td>
<td></td>
</tr>
<tr>
<td>- <em>only</em> seen in combination with other malignant Germ Cell elements</td>
<td></td>
</tr>
</tbody>
</table>

Similar Histology: biphasic admixture of syncitiotrophoblast & cytotrophoblast  
or syncitiotrophoblast & intermediate trophoblast
Choriocarcinoma — Histology
Pathology of Gestation – Summary

- **placenta**
  - problems vary depending upon gestational age
  - gross examination important
  - microscopic evaluation may reflect the state of the maternal-fetal interface at delivery

- **trophoblastic disease**
  - understanding the neoplastic potential of placental tissue