

Placenta – The Pathologies of Two Patients

Elizabeth Cutler

Drexel University, Graduate School of Biomedical Sciences and Professional Studies

Abstract

Placenta specimens fall into a unique category such that abnormalities and pathologies identified may impact not just one patient, but two – the mother and the neonate/fetus. Placental examination can provide crucial information in cases of abnormal pregnancy or labor, or fetal, neonatal or maternal deaths. Understanding the associations between gross findings and maternal and neonatal clinical outcomes can improve the quality of care delivered by pathologists’ assistants.

Introduction

Placental examinations involve the detailed investigation of three major placental tissues – the membranes, the umbilical cord and the placental parenchyma. Membrane color, opacity, site of rupture, and insertion can provide information that may be relevant in cases of stillbirth, placenta previa and bleeding in early pregnancy. Umbilical cord length, diameter, insertion, coil index, and the presence of true knots, thrombosis or strictures can provide information that may correlate to complications and adverse outcomes including but not limited to stillbirth, fetal growth restriction, maternal and fetal vascular malperfusion, and preterm delivery. Gross features of the disk including size, weight and shape in addition to lesions of the placental parenchyma such as infarcts, thrombosis and retroplacental hemorrhage may correlate to maternal vascular malperfusion and various adverse neonatal outcomes including prolonged hospitalization following birth, low birth weight and neonatal death.

Methods

A review of current literature describing the relationships between gross and histologic findings to fetal, neonatal and maternal outcomes.

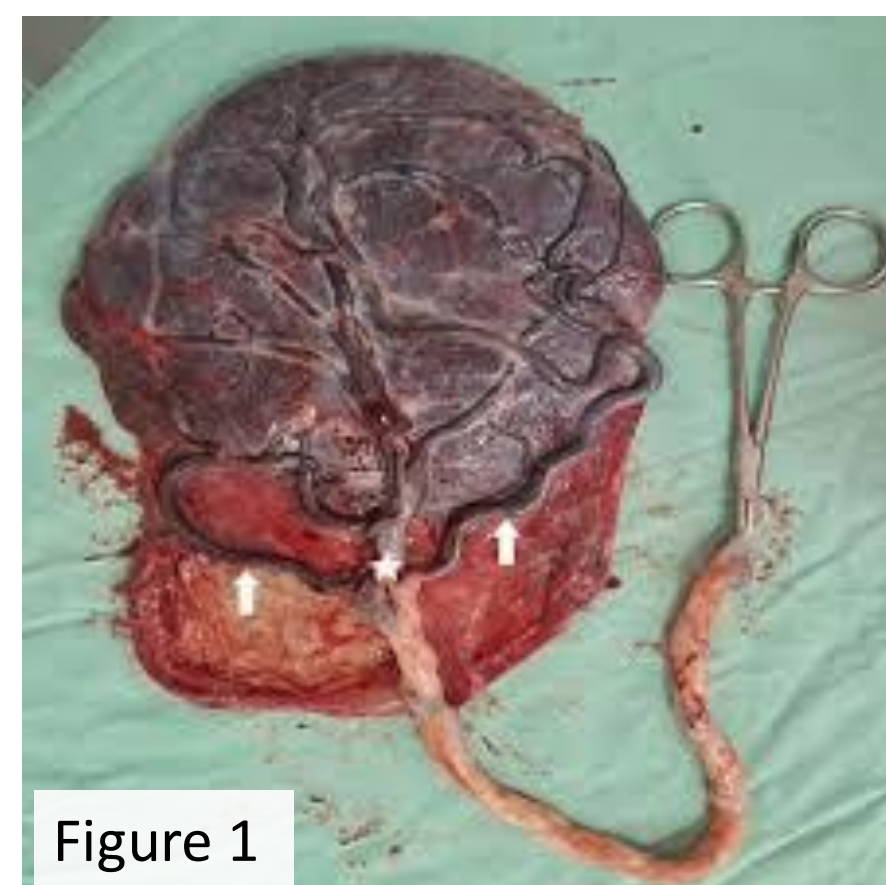


Figure 1. Velamentous umbilical cord insertion. Potosi-García JA, Velez-Varela JH, Morales-Benitez RH, Velez-Tamayo J, Peña-Zarate EE, Escobar-Vidarte ME. Prenatal ultrasound diagnosis of velamentous cord insertion: a case report and review of the literature. *J Ultrasound*. 2024;27(1):173-177. doi:10.1007/s40477-023-00822-3
Figure 2. Hypercoiling of the umbilical cord. Trevisanuto D, Doglioni N, Zanardo V, Chiarelli S. Overcoiling of the umbilical cord. *J Pediatr*. 2007;150(1):112. doi:10.1016/j.jpeds.2006.11.042

The Fetal Membranes

Gross features of the membranes including insertion, color, opacity, completeness and rupture site are typically included in a gross description. Circumvallate insertion can be associated with bleeding during early pregnancy¹. Additionally, circumvallate insertion can be associated with preterm delivery, placental abruption, emergency cesarean section, neonatal intensive care unit admission, chronic lung disease and neonatal death². Meconium passage is associated with fetal acidemia, fetal hypoxia, chorioamnionitis, low APGAR scores³ and increased risk of meconium aspiration syndrome, which can be characterized by respiratory distress and pneumonitis^{3,4}.

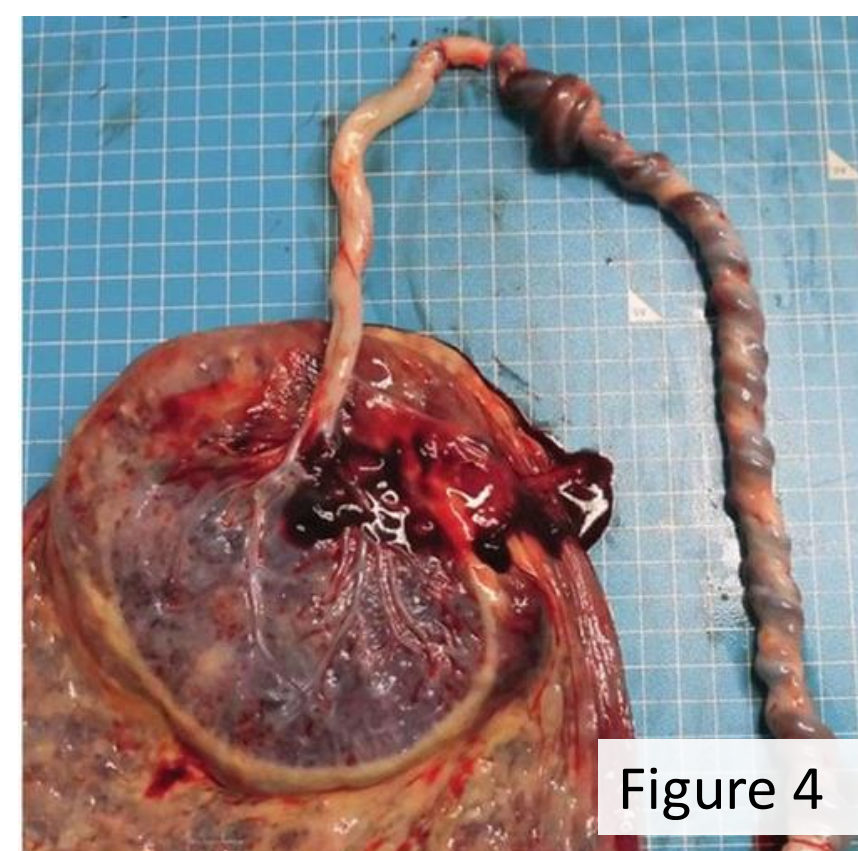


Figure 3. Meconium-stained placenta and fetal membranes. Aleksandra Karaseva, M.D., Lucy Ma, M.D. Placenta – Nonneoplastic placental conditions abnormalities– Noninfectious – Meconium staining. PathologyOutlines. Published November 22, 2023. Accessed June 11, 2026. <https://www.pathologyoutlines.com/topic/placentameconium.html>
Figure 4. Hasegawa J, Furuya N, Doi M, Sasaki T, Takagi M, Suzuki N. Sono-embryological assessments of a true knot that developed into a hypercoiled cord and circumvallate placenta. *J Matern Fetal Neonatal Med*. 2021;34(24):4162-4166. doi:10.1080/14767058.2019.1704247

The Umbilical Cord

Gross features of the umbilical cord including length, diameter, insertion site, insertion type, coil index, coil handedness and presence of true knots are typically included in a gross description. Excessively long umbilical cords have been found to be associated with adverse outcomes including delivery complications, respiratory distress, cord entanglement, fetal hypoxia and altered blood flow⁵. Thin cords are associated with fetal growth restriction while thick cords have been associated with maternal diabetes and fetal hydrops¹. Marginal and velamentous insertions are associated with preterm delivery¹. Hypocoiling of the umbilical cord is associated with adverse outcomes such as fetal death, spontaneous preterm delivery, trisomies, low Apgar score at 5 minutes, velamentous cord insertion and single umbilical artery⁶. Hypercoiling of the umbilical cord is associated with adverse outcomes such as asphyxia, small gestational age infants, trisomies and single umbilical artery⁶. True knots are associated with umbilical cord entanglement⁷ and umbilical cord occlusion⁸, which can increase the risk of stillbirth.

The Placental Disk

Gross features of the placental disk including size, shape, weight, mural thickness, appearance of the fetal surface, appearance of the maternal surface, completeness of the maternal surface and cut surface of the placental parenchyma are all included in a gross description. Size, shape and weight of the placental disk are indicators of overall placental functioning, with abnormalities associated fetal growth restriction and reduced fetal movements, which can have long-term impacts on the neonate’s health¹. Abnormalities including placental hypoplasia (defined as low weight for stated gestational age or context and/or umbilical cord thinning), infarction and retroplacental hemorrhage are associated with maternal vascular malperfusion (MVM)¹. Other MVM lesions include acute atherosclerosis, fibrinoid necrosis, arterial thrombosis, mural hypertrophy, absence of spiral artery remodeling, distal villous hypoplasia and accelerated villous maturation⁹. High-grade MVM has been associated with gestational hyperglycemia and hypertension and adverse outcomes including low birth weight, longer neonatal hospital stay and fetal cerebral hemorrhage⁹. Retroplacental hemorrhage produces an indentation in the placental parenchyma and is clinical related to placental abruption, which is associated with maternal mortality and stillbirth¹⁰. Massive perivillous fibrin deposition, defined generally as fibrin deposition involving 25% or more of the villi, is associated with various adverse outcomes including preterm birth, intrauterine fetal demise, intrauterine growth restriction¹¹.



Figure 5. Marginal infarct. Chen A. Infarct. PathologyOutlines.com website. <https://www.pathologyoutlines.com/topic/placentaplaininfarct.html>. Accessed June 15th, 2026

Discussion

Current literature suggests numerous intricate relationships between gross and histologic features of placenta specimens and maternal and neonatal clinical outcomes. Ensuring that placental examination involves the quality assessment of all pertinent aspects of the specimen can allow for improved quality of care provided by pathologists’ assistants to two patients - the mother and the neonate/fetus.

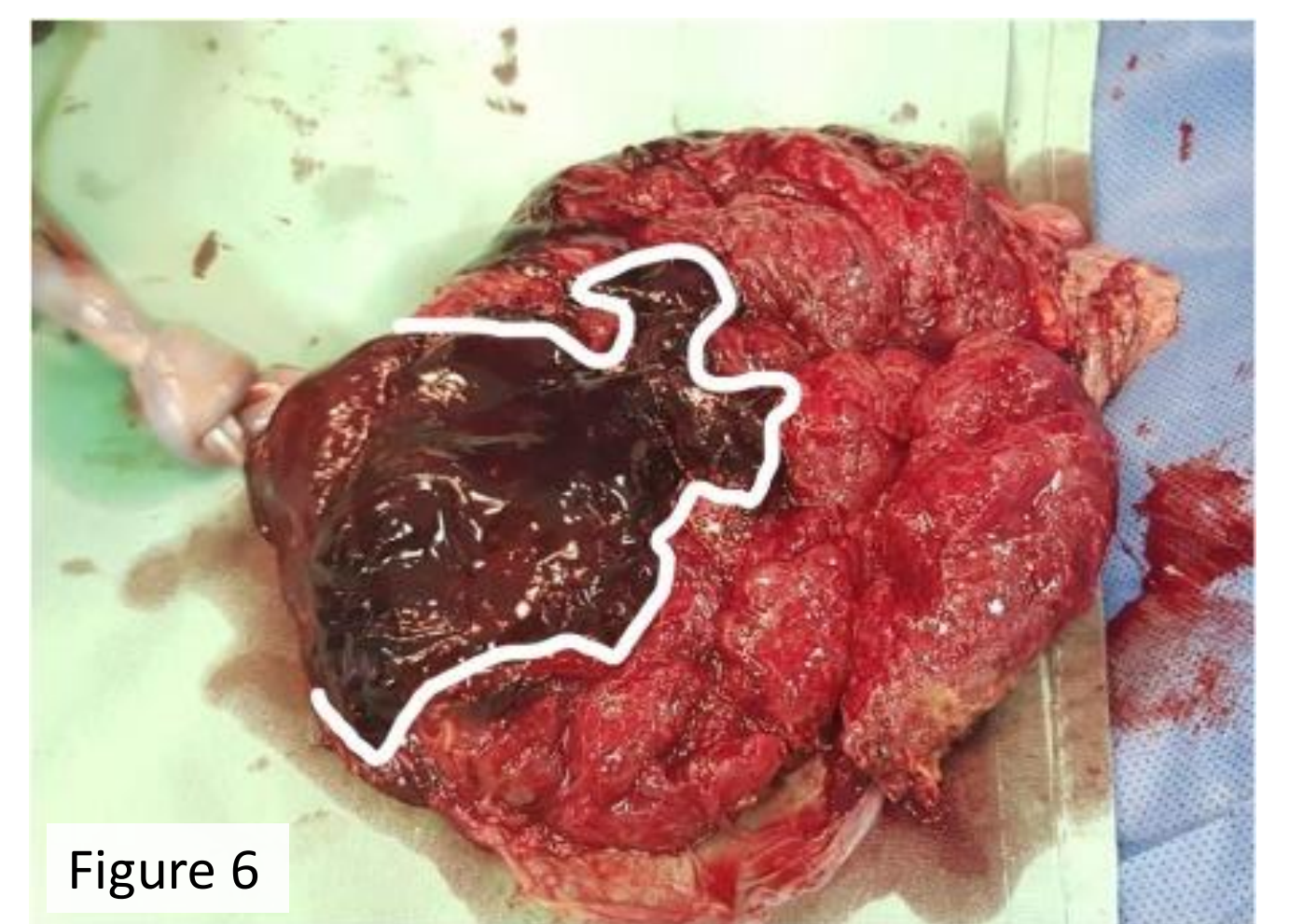


Figure 6

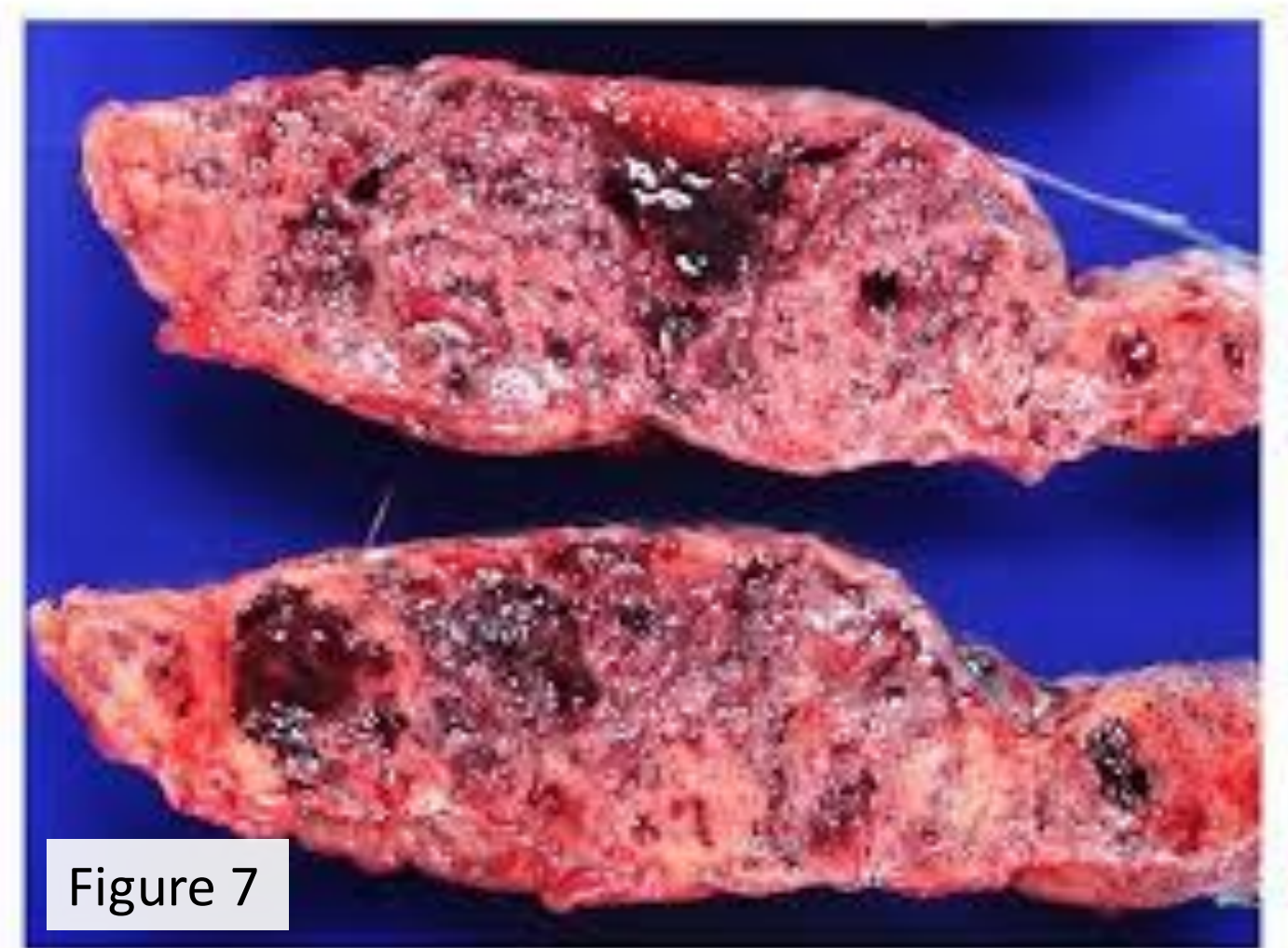


Figure 7

Figure 6. Retroplacental abruption. Levy M, Gonen N, Kovo M, et al. Does macroscopic estimation of the extent of placental abruption correlate with pregnancy outcomes? *Eur J Obstet Gynecol Reprod Biol*. 2020;254:188-194. doi:10.1016/j.ejogrb.2020.09.039
Figure 7. Perivillous fibrin deposition. Kostadinov S, Robbins KA, Hayward A. Abnormal TREC-Based Newborn Screening Test in a Premature Neonate with Massive Perivillous Fibrin Deposition of the Placenta. *Case Reports Immunol*. 2016;2016:5083274. doi:10.1155/2016/5083274

Sources

- Khong TY, Mooney EE, Ariel I, et al. Sampling and Definitions of Placental Lesions: Amsterdam Placental Workshop Group Consensus Statement. *Arch Pathol Lab Med*. 2016;140(7):698-713. doi:10.5858/arpa.2015-0225-CC
- Taniguchi H, Aoki S, Sakamaki K, et al. Circumvallate placenta: associated clinical manifestations and complications-a retrospective study. *Obstet Gynecol Int*. 2014;2014:986230. doi:10.1155/2014/986230
- Gallo DM, Romero R, Bosco M, et al. Meconium-stained amniotic fluid. *Am J Obstet Gynecol*. 2023;228(5S):S1158-S1178. doi:10.1016/j.ajog.2022.11.1283
- Cimic A, Baergen RN. Meconium-Associated Umbilical Vascular Myonecrosis: Correlations with Adverse Outcome and Placental Pathology. *Pediatr Dev Pathol*. 2016;19(4):315-319. doi:10.2350/15-06-1660-OA.1
- Baergen RN, Malicki D, Behling C, Benirschke K. Morbidity, mortality, and placental pathology in excessively long umbilical cords: retrospective study. *Pediatr Dev Pathol*. 2001;4(2):144-153. doi:10.1007/s100240010135
- de Laat MW, Franx A, Bots ML, Visser GH, Nikkels PG. Umbilical coiling index in normal and complicated pregnancies. *Obstet Gynecol*. 2006;107(5):1049-1055
- Chen S, Liu Z, Lin Q, Huang L. Risk factors and outcomes associated with true knots of the umbilical cord: A retrospective study. *Taiwan J Obstet Gynecol*. 2025;64(1):40-45. doi:10.1016/j.tjog.2024.07.019
- Waller JA, Saade G. Stillbirth and the placenta. *Semin Perinatol*. 2024;48(1):151871. doi:10.1016/j.semper.2023.151871
- Jiang H, Shi D, Cai L, et al. Characteristics of maternal-placental vascular malperfusion and its correlation with neonatal adverse outcomes. *J Reprod Immunol*. 2025;168:104452. doi:10.1016/j.jri.2025.104452
- Bestel M, Ucar E, Sezer S. The severity of placental abruption and its dual impact on maternal and neonatal outcomes: A retrospective observational study. *Medicine (Baltimore)*. 2025;104(52):e46921. doi:10.1097/MD.00000000000046921
- Lampi K, Papadogiannakis N, Sirotkina M, Pettersson K, Ajne G. Massive perivillous fibrin deposition of the placenta and pregnancy outcome: A retrospective observational study. *Placenta*. 2022;117:213-218. doi:10.1016/j.placenta.2021.12.013