

Contents

Preface	v
1 Placental Types	1
Placental Shapes	3
Types of Maternofetal Interdigitation	3
Maternofetal Barrier	6
Maternofetal Blood Flow Interrelations	8
Placental Types and Phylogeny	9
Human Placenta	12
2 Examination of the Placenta	14
Macroscopic Examination	14
Storage	14
Selection	15
Photography	15
Examination	15
Placentas of Multiple Births	20
Fixation	21
Special Procedures	22
3 Macroscopic Features of the Delivered Placenta	25
4 Microscopic Survey	28
Typical Histological Features of the First Trimester Placenta	28
Typical Histological Features of the Third Trimester Placenta	34
Immunohistochemical Markers	38
5 Normative Values and Tables	41

6	Early Development of the Human Placenta	49
	Prelacunar Stage	49
	Lacunar Stage	51
	Early Villous Stages	53
7	Basic Structure of the Villous Trees	57
	<i>M. Castellucci and P. Kaufmann</i>	
	Syncytiotrophoblast	57
	Syncytium or Multinucleated Giant Cells?	57
	Syncytial Plasmalemmas and Microvilli	60
	Syncytiotrophoblastic Cytoskeleton	61
	Specialized Regions of the Villous Surface	62
	Epithelial Plates	62
	Syncytial Lamellae Covering Langhans' Cells	64
	Syncytiotrophoblast with Prevailing Rough Endoplasmic Reticulum	64
	Syncytiotrophoblast with Prevailing Smooth Endoplasmic Reticulum	65
	Syncytial Knots, Sprouts, Bridges, and Stromal Trophoblastic Buds	66
	Transtrophoblastic Channels	69
	Plasma Protrusions or Blebs	70
	Villous Cytotrophoblast (Langhans' Cells)	71
	Langhans' Cells as Precursors of the Syncytiotrophoblast	71
	Langhans' Cell Types	71
	Nematosomes	74
	Endocrine Activity of the Langhans' Cells	74
	Functional Aspects of Syncytial Fusion	75
	Regulation of Cytotrophoblastic Proliferation and Fusion	78
	Trophoblastic Basement Membrane	81
	Connective Tissue	81
	Mesenchymal Cells	81
	Reticulum Cells	81
	Fibroblasts	82
	Myofibroblasts	83
	Matrix Components of the Villous Stroma	84
	Hofbauer Cells	84
	First Descriptions	84
	Morphology	84
	Occurrence and Distribution	85
	Origin	86
	Immunological Aspects	86
	Other Free Connective Tissue Cells	92
	Development and Structure of Fetal Villous Vessels	92
	Origin of the Hemangioblastic Cells	92
	Capillary Formation During Early Pregnancy	92
	Basic Structure of the Vessel Walls	93
	Fibrinoid of the Villous Tree	94
	Perivillous Fibrinoid	94
	Intravillous Fibrinoid	96
	Cell Biological Trends	97
	Cell Isolation and Culture	97
	Growth Factors, Growth Factor Receptors, Oncogenes	97

Proteases	98
Extracellular Matrix	98
8 Architecture of Normal Villous Trees	116
Structure of Villous Types	116
Stem Villi	116
Immature Intermediate Villi	119
Mature Intermediate Villi	122
Terminal Villi	124
Mesenchymal Villi	124
Immunohistochemical Characterization of Villous Types	126
Differentiation and Maturation of Villous Types	127
Development of Mesenchymal Villi	127
Development and Fate of Immature Intermediate Villi	130
Development of Stem Villi	131
Development of Mature Intermediate Villi	132
Development of Terminal Villi	132
Angioarchitecture of Villi	132
Vascular Arrangement in Immature Villi	132
Large Vessels of Stem Villi	133
Paravascular Capillary Net of Stem Villi	133
Arrangement of Vessels in Mature Intermediate and Terminal Villi	135
Sinusoids of Terminal Villi	137
Capillary Growth as Related to the Development of Terminal Villi	138
Intervillous Space as Related to the Villous Trees	139
Control of Villous Development	142
Oxygen as Regulator of Villous Development	142
Hormones as Regulators of Villous Development	143
Fetomaternal Flow Interrelations	144
9 Characterization of Developmental Stages	151
Stages of Development	151
Nucleated Red Blood Cells	164
10 Three-Dimensional Aspects of Villous Maldevelopment	167
Villous Cross-Sectional Features	167
Villous Maldevelopment	170
Normal Mature Placenta	170
Synchronous Villous Immaturity	171
Persisting Villous Immaturity and Rhesus Incompatibility	171
Terminal Villi Deficiency	173
Maternal Diabetes Mellitus	174
Villous Hypermaturity and Preterm Villous Maturation	175
IUGR Combined with Absent End-Diastolic Umbilical Blood Flow	175
Preeclampsia, Hypertensive Disorders, and Placentas at High Altitude	176
Prolonged Pregnancy	177
Classification of Villous Maldevelopment	178

11 Nonvillous Parts of the Placenta	182
Extravillous Trophoblast	182
Nomenclature	182
Historical Aspects	183
Composition of the Extravillous Trophoblast Population	184
One Stem Cell Origin for Villous Syncytiotrophoblast and the Extravillous Trophoblast?	187
Invasive Properties of the Extravillous Trophoblast	189
Extravillous Trophoblast and Maternofetal Immune Interactions	190
Secretory Activities of Extravillous Cytotrophoblast	190
Placental Site Giant Cells	193
Multinucleated Trophoblastic Giant Cells	193
Syncytiogenesis	195
Decidua	196
Endometrial Stromal Cells and Decidual Cells	196
Functional Relevance of Decidual Cells	198
Endometrial Large Granular Lymphocytes	199
Macrophages	200
G Cells	200
Glandular Residues	201
Extracellular Matrix	201
Decidual Degeneration	201
Fibrinoid	203
Definition of Fibrinoid	203
Types of Fibrinoid	204
Origin of Fibrinoid	205
Interactions Between Matrix-Type and Fibrin-Type Fibrinoid	207
Functional Conclusions	208
Calcification	210
Chorionic Plate	213
Development	213
Structure at Term	214
Amnion	214
Spongy Layer	214
Chorionic Mesoderm	215
Extravillous Cytotrophoblast	216
Langhan's Fibrinoid Layer	218
Marginal Zone	218
Subchorial Closing Ring	218
Trabeculae	219
Marginal Sinus	219
Basal Plate	219
Trophoblastic Shell and Development of the Basal Plate	219
Layers of the Basal Plate at Term	222
Development of Uteroplacental Vessels	227
Number and Position of Uteroplacental Vessels	227
Structure of Uteroplacental Arteries	228
Structure of Uteroplacental Veins	231
Intraarterial Trophoblast	231
Intramural Fibrinoid of Uteroplacental Arteries and Veins	233
Functional Aspects of Uteroplacental Vessels	234
Septa	234
Cell Islands	237
Cell Columns	239

Cysts and Breus' Mole	239
Pathology of Maternal Floor Infarction	245
12 Anatomy and Pathology of the Placental Membranes	268
Development	270
Amnion	273
<i>Amnionic Epithelium: Different Cell Types or Cell</i>	
Degeneration	273
Cytological and Functional Aspects of the Amnionic Epithelium	274
Amnionic Fluid	277
Chromosomal Determinations	278
Cellular Metaplasia and Glycogen	278
Amnionic Mesoderm	279
Medley of Themes	280
Clinical and Research Applications	281
Chorion Laeve	281
Intermediate (Spongy) Layer	282
Chorionic Mesoderm	282
Trophoblast Layer	283
Immunological Considerations of the Trophoblast	284
Decidua	284
Tensile Properties of the Membranes	285
Cysts, Tumors, Hemorrhage	286
Amniotic Fluid Embolism	288
Meconium	290
Gastroschisis	296
Epidermolysis Bullosa	297
Amnion Nodosum	297
Amnionic Bands	299
Extramembranous Pregnancy	305
13 Anatomy and Pathology of the Umbilical Cord and	
 Major Fetal Vessels	319
Development	319
Amnionic Epithelium	319
Wharton's Jelly	321
Structure of Umbilical Vessels	321
Innervation	323
Contractility of Umbilical Vessels	323
Hyrtil Anastomosis, False Knots, and Hoboken Nodes	325
Allantois	325
Omphalomesenteric Duct	326
Spiral Turns of the Cord	330
Length of the Cord	332
Abnormal Length, Nuchal Cord	333
Site of Cord Insertion	337
Furcate Cord Insertion	338
Velamentous Cord Insertion	338
Placental Surface Vessels	342
Nucleated Red Blood Cells	345
Cysts and Edema	345
Single Umbilical Artery	347
Placental Transfusion	349

Knots	350
False Knots	351
Strictures	352
Rupture	353
Hematoma	353
Varices and Aneurysms	355
Thrombosis of the Umbilical Vessels	357
Thrombosis of the Placental Vascular Tree	360
Tumors of the Umbilical Cord	365
14 Placental Shape Aberrations	378
Site of Placental Attachment	378
Volumetric Growth	379
Abnormal Shapes (“Errors in Outline”)	380
Placenta Previa	383
Placenta Accreta	387
Placenta Increta and Percreta	389
Placenta Membranacea	390
Placenta in Ectopic Pregnancy	392
Placenta in Abdominal Pregnancy	393
Circumvallate Placenta (Extrachorial and Circummarginate Placentas)	394
15 Histopathological Approach to Villous Alterations	404
Microscopic Evaluation	404
Assessment of Villous Maturation	404
Placental Insufficiency	406
Examination of Fetal Stem Vessels	407
Examination of the Fetal Capillary Bed	407
Villous Architecture and Fibrinoid	409
Intervillous Space, Infarcts	409
Abruptio Placentae	410
Major Histopathological Findings	410
Syncytiotrophoblast	410
Knotting of the Syncytiotrophoblast	411
Langhans’ Cells	412
Vasculosyncytial Membranes	412
Trophoblastic Basement Membrane	413
Perivillous Fibrinoid	413
Intravillous Fibrinoid	413
Villous Calcification	413
Stem Vessels	414
Nucleated Red Blood Cells	414
Villous Capillarization	414
Stromal Architecture and Stromal Fibrosis	415
Hofbauer Cells (Macrophages)	415
Inflammatory Changes	416
Villous Edema or Immaturity	417
16 Erythroblastosis Fetalis and Hydrops Fetalis	421
Erythroblastosis Fetalis	421
Placental Pathology in Erythroblastosis	422

Nonimmune Hydrops	427
α -Thalassemia	428
Fetal Hemorrhage	430
Fetal Tumors	431
Congenital Anomalies and Hydrops Fetalis	433
Congenital Heart Disease	434
Cardiac Arrhythmias	435
Nephrotic Syndrome	435
Parvovirus Anemia	436
Hydrops of Unknown Etiology	439
 17 Transplacental Hemorrhage, Cell Transfer, Trauma	449
Transplacental Blood and Cell Transfer	449
Trauma	449
Placenta in Hemorrhage	454
Technique for Identification of Fetal Red Blood Cells	455
Significant Transplacental Hemorrhage	458
Fetal Consequences of Massive Hemorrhage Across the Placenta	459
Other Fetal Blood Elements Passing Through the Placenta	463
Mother to Fetus Transfer of Cells	464
 18 Fetal Storage Disorders	471
 19 Maternal Diseases Complicating Pregnancy: Diabetes, Tumors, Preeclampsia, Lupus Anticoagulant	476
Maternal Diseases	476
Hematological Disorders	483
Endocrine Disorders	485
Diabetes During Pregnancy	486
Maternal Neoplasms	489
Hypertensive Disorders	493
Preeclampsia	493
Animal Models	493
Placental Pathology of Preeclampsia	494
Decidual Arteriopathy	494
Infarcts	500
Abruptio Placentae	503
Fetal Effects of Abruptio Placentae	508
Other Placental Changes in Preeclampsia	508
Etiology of Toxemia, PIH or Preeclampsia	511
Lupus Erythematosus and Lupus Anticoagulant	512
Lupus Erythematosus	512
Lupus Anticoagulant	515
 20 Infectious Diseases	537
Chorioamnionitis	537
Macroscopic Appearance	537
Microscopic Appearance	538

General Considerations of Chorioamnionitis	551
Specific Microorganisms	553
Leprosy	559
Tuberculosis	560
Listeriosis	560
Bacterial Vaginosis	564
<i>Mycoplasma hominis</i> and <i>Ureaplasma urealyticum</i>	564
<i>Chlamydia trachomatis</i>	566
Syphilis	567
Necrotizing Funisitis	568
Other Spirochetal Diseases	571
Fungus Infections	572
Virus Infections and Villitides	575
Cytomegalovirus Infection	575
Herpes Simplex Virus Infection	580
Varicella (Chickenpox)	584
Epstein-Barr Virus	584
Smallpox, Vaccinia, Alastrim, Parvovirus B19	584
Enteroviruses	585
Influenza, Mumps, Rabies	586
Hepatitis	586
Rubella (German Measles)	587
Rubeola (Measles)	587
Human Immunodeficiency Virus Infection	588
Toxoplasmosis	589
Chagas' Disease	593
Babesiosis, Trichomoniasis	593
Malaria	593
Other Parasitic Infections	595
Villitis of Unknown Etiology	596
 21 Abortion, Placentas of Trisomies, and Immunological Considerations of Recurrent Reproductive Failure	 624
Anatomical Findings	626
Summary of Placental Findings in Chromosomally Defined Abortions	 629
Induced Abortion	633
Incomplete Abortion	636
Placenta in Chorionic Villus Sampling	637
Trisomic Placentas	640
Chemical Markers and Trisomy	641
Other Findings	641
Recurrent or Habitual Abortion	642
 22 Molar Pregnancies	 653
Hydatidiform Moles	653
Incidence	654
Genetics	655
Morphology	659
Other Characteristics	664
Deportation	665

Chorioadenoma Destruens (Invasive Mole).....	666
Therapy	668
Ectopic Moles	670
Partial Hydatidiform Mole	670
Mole and Fetus	673
PHM with Twin Gestation	675
 23 Choriocarcinoma	 686
Choriocarcinoma In Situ and Choriocarcinoma with Pregnancy	692
Trophoblastic Pseudotumors	695
Ultrastructure	698
Antigenic Studies	698
Epidemiology	699
Endocrine Aspects	700
Ectopic Choriocarcinomas; Tumors in Men	700
Therapy	701
Choriocarcinoma in Animals	702
Choriocarcinoma in Cell Lines and Genetics	702
 24 Benign Tumors	 709
Angiomas	709
Other Benign Tumors	715
Chorangiosis, Chorangiomas	715
 25 Multiple Pregnancy	 719
Zygoty	719
Placenta in the Study of Zygoty	720
Causes and Incidence of Multiple Births	725
Third Type of Twin	731
Twinning Incidence	731
Superfetation and Superfecundation	733
Vascular Anatomy of Twin Placentas	733
Monoamnionic Monochorionic Twin Placenta	742
Diamnionic Monochorionic Twin Placenta	752
Diamnionic Dichorionic Twin Placenta	755
Vanishing Twin Phenomenon	757
Fetus Papyraceus	759
Transfusion Syndrome	767
Acardiac Twins	778
Conjoined Twins	786
Sacroccygeal Teratoma, Epignathus	789
Congenital Anomalies	791
Cytogenetics and "Heterokaryotypic MZ Twins"	792
Chimerism, Mosaicism	792
Whole-Body-Chimerism	794
Triplets and Higher Multiple Births	794
Twins Associated with Abortion and Ectopic Pregnancy	802
Morbidity and Mortality	803
Hormones in Twin Pregnancy	806

26	Involution of Implantation Site and Retained Placenta	827
	Involution of the Placenta Site	827
	Subinvolution	829
	Placental Polyps	830
	Involution of a Remaining Placenta	832
27	Legal Considerations	835
	Twinning Problems	838
	Inflammation	839
	Green Placenta	841
	Vascular Abnormalities	842
	Umbilical Cord	843
	Placental Villous Color	843
	Other Types of Pathology	844
28	Glossary	849
	Index	853