

Contents

Preface	Julian I.E. Hoffman	xii
List of contributors		xiii
1 Cardiac morphogenesis	<i>Adriana C. Gittenberger-de Groot, Monique R.M. Jongbloed, Marco C. de Ruiter, Margot M. Bartelings, and Robert E. Poelmann</i>	1
2 Cardiac anatomy and examination of specimens	<i>Diane E. Spizer</i>	18
3 Placental implantation and development	<i>Simcha Yagel and Debra S. Goldman-Wohl</i>	36
4 Placental circulations	<i>Eric Jourimain and Graham J. Burton</i>	49
5 Technical advances in fetal echocardiography	<i>Boris Tatschek and David Sahn</i>	63
6 Epidemiology of congenital heart disease: Etiology, pathogenesis, and incidence	<i>Julian I.E. Hoffman</i>	78
7 Indications for fetal echocardiography: Screening in low- and high-risk populations	<i>Anita J. Nixon-Grady, Mary T. Demafrio, Sarah M. Cohen, and Simcha Yagel</i>	86
8 Circulation in the normal fetus and cardiovascular adaptations to birth	<i>Abraham M. Rudolph</i>	101
9 Development of fetal cardiac and extracardiac Doppler flows in early gestation	<i>Wimra Senavall, Ulrich Gembruch, and Ahmet A. Baschat</i>	120
10 Examination of the normal fetal heart using two-dimensional echocardiography	<i>Rabih Chaoui</i>	137
11 The three vessel and tracheal view	<i>Julia Solomon</i>	148
12 First and early second trimester fetal heart screening	<i>Simcha Yagel, Sarah M. Cohen, Reuven Achiron, Yaron Zalel, and Alfred Abuhamad</i>	159
13 Four-dimensional ultrasound examination of the fetal heart using spatiotemporal image correlation (STIC)	<i>Luis F. Gonçalves</i>	174
14 Three- and four-dimensional ultrasound in fetal echocardiography: A new look at the fetal heart	<i>Simcha Yagel, Sarah M. Cohen, Israel Shapiro, Baruch Messing, and Dan V. Valsky</i>	195
15 Magnetic resonance imaging: Techniques and normal fetal cardiovascular physiology	<i>David Marini, Sharon Portnoy, and Mike Seed</i>	217
16 Magnetic resonance imaging: Abnormalities of the fetal circulation	<i>David Marini, Sharon Portnoy, and Mike Seed</i>	231
17 Abnormal visceral and atrial situs and congenital heart disease	<i>Varsha Thakur, Edgar T. Jaeggi, and Shi-Joon Yoo</i>	239
18 Cardiac malpositions and syndromes with right or left atrial isomerism	<i>Rabih Chaoui</i>	253

viii Contents

19	Pulmonary vein anomalies <i>Anita J. Moon-Grady</i>	263
20	Ebstein malformation and tricuspid valve pathology <i>Lindsay R. Freud, Wayne Tworetzky, and Norman H. Silverman</i>	275
21	Intracardiac shunt malformations <i>Einat Birk and Norman H. Silverman</i>	283
22	Atrioventricular septal defect ("atrioventricular canal") <i>Laurent Fermont and Lucile Houyel</i>	292
23	Double-inlet ventricle <i>Astrid Hellmund and Ulrich Gembrych</i>	304
24	Lesions of the right heart <i>Julene S. Carvalho</i>	309
25	Ventricular outflow tract anomalies ("conotruncal anomalies") <i>Varsha Thakur, Edgar T. Jaeggi, and Shi-Joon Yoo</i>	329
26	Tetralogy of Fallot <i>Michael D. Puchalski</i>	342
27	Double-outlet right ventricle <i>Luke Eckersley and Lisa K. Hornberger</i>	350
28	Truncus arteriosus <i>Shaine A. Morris and Diego A. Lara</i>	359
29	Transposition of the great arteries <i>Silvia G.V. Alvarez and Lisa K. Hornberger</i>	372
30	Left heart malformations <i>Brian S. Snarr, Michael Y. Liu, and Jack Rychik</i>	388
31	Aortic arch anomalies <i>Varsha Thakur, Edgar T. Jaeggi, and Shi-Joon Yoo</i>	401
32	Coarctation of the aorta and interrupted aortic arch <i>Max E. Godfrey and Wayne Tworetzky</i>	413
33	Diseases of the myocardium, endocardium, and pericardium during fetal life and cardiomyopathy in the fetus <i>Simone R.F. Fontes Pedra and Carlos A.C. Pedra</i>	421
34	Ultrasound examination of the fetal coronary circulation <i>Ahmet A. Baschat, Ulrich Gembrych, and Viola Seravalli</i>	430
35	The fetal venous system: Normal embryology, anatomy, and physiology and the development and appearance of anomalies <i>Simcha Yagel, Ori Shen, Sarah M. Cohen, and Dan V. Valsky</i>	443
36	Fetal cardiac tumors <i>Lisa K. Hornberger and Angela McBrien</i>	465
37	The fetal thymus <i>Elena S. Sinkovskaya and Alfred Abuhamad</i>	472
38	Extracardiac Doppler investigation in fetuses with congenital heart disease <i>Annegret Geipel, Ulrich Gembrych, and Christoph Berg</i>	496
39	Electrophysiology for the perinatologist <i>Edgar T. Jaeggi</i>	504
40	Fetal bradycardia <i>Bettina F. Cuneo</i>	515
41	Fetal tachyarrhythmia <i>Ulrich Gembrych</i>	530

42	Cardiac diseases in association with hydrops fetalis <i>Ulrich Gembruch and Wolfgang Holzgreve</i>	548
43	Congestive heart failure in the fetus <i>James C. Huhta</i>	579
44	Twin-twin transfusion syndrome: Impact on the cardiovascular system <i>Jack Rychik</i>	596
45	Fetal interventions for congenital heart disease <i>Lindsay R. Freud, Max E. Godfrey, and Wayne Tworetzky</i>	606
46	Doppler evaluation in fetal growth restriction <i>Javier Caradeux and Francesc Figueras</i>	614
47	Venous flow dynamics: Intrauterine growth restriction and cardiac decompensation <i>Torvid Kiserud</i>	622
48	Evaluation of fetal cardiac function: Techniques and implications <i>Christoph Wohlmuth and Helena M. Gardiner</i>	634
49	Genetics and cardiac anomalies <i>Hagit Shani, Pe'er Dar, and Mark I. Evans</i>	643
50	Cardiac defects in chromosomally abnormal fetuses <i>Ritu Mogra and Jon Hyett</i>	651
51	Associated anomalies in congenital heart disease <i>Christoph Berg, Ulrich Gembruch, and Anneliese Geipel</i>	665
52	Chromosome microarray analysis of the fetal heart <i>Karina Seidl Nall</i>	683
53	Congenital cardiovascular malformations and the fetal and neonatal circulation <i>Abraham M. Rudolph</i>	690
54	Intrapartum evaluation of fetal well-being <i>Hagai Amsalem, Yoram Sorokin, and Sean C. Blackwell</i>	705
55	Intrapartum and delivery room management of the fetus with congenital heart disease <i>Mary T. Donofrio and Anita J. Moon-Grady</i>	715
56	The neonate with congenital heart disease: Medical and interventional management <i>Alexander Lowenthal, Ulrike Herberg, and Einat Birk</i>	729
57	Infants with congenital heart disease in the first year of life <i>Andrew J. Parry and Frank L. Hanley</i>	753
58	Neurodevelopment in congenital heart disease: Intrauterine Doppler and fetal and neonatal magnetic resonance imaging <i>Shabnam Peyvandi and Mary T. Donofrio</i>	766
59	Postnatal neurodevelopment in congenital heart disease: Short- and long-term neurodevelopment and interventions <i>Hedwig H. Hövels-Gürich and Christopher G. McCusker</i>	775
60	Genetic counseling in families with congenital heart defects <i>Klaus Zerres and Sabine Rudnik-Schöneborn</i>	784
61	Cardiac disease in pregnancy <i>Sabrina D. Phillips and Frank Cetta</i>	792
62	Maternal diseases and therapies affecting the fetal cardiovascular system <i>Waltraut M. Merz and Ulrich Gembruch</i>	809
	Index	819