

Contents

Introduction ... 1

Radiology and Nuclear Medicine—

A Brief Comparison 1

W. Heindel, O. Schober

1 Basic Principles ... 3

Basic Technical Principles and Radiation Safety 3

J. Eckardt, N. Meier

Basic Technical Principles 3

Radiation Safety 12

Radiopharmaceuticals for PET 14

K. Kopka, S. Wagner

Definition of Terms 15

Radionuclide Production 16

PET Radiopharmaceuticals 17

Radiographic Contrast Media 25

B. Buerke

Enteral Radiographic Contrast Media 26

Parenteral Radiographic Contrast Media 26

Examination Protocols 30

K. U. Juergens, M. Weckesser

Basic Considerations 30

Patient Preparation 33

Protocol Selection and Examination Technique 34

Quantification of Tracer Uptake 35

Imaging in Children 37

K. U. Juergens

Protocol 37

Special Requirements and Problems in Pediatric

Patients 37

Advantages of PET-CT 42

Basic Principles of Image Interpretation 44

M. Weckesser, R. Fischbach

Interpretation of CT 44

Interpretation of PET 46

Interpretation of PET-CT 47

Pitfalls in PET Interpretation 47

Summary 58

Basic Technical Principles and Radiation Safety 58

Radiopharmaceuticals for PET 58

Radiographic Contrast Media 59

Examination Protocols 59

Imaging in Children 60

Basic Principles of Image Interpretation 60

2 Imaging of Neoplastic Diseases ... 61

Brain Tumors 61

M. Weckesser, S. Kloska

CT 63

PET 66

PET-CT 74

Head and Neck Tumors 75

M. Weckesser, P. M. Schlegel

CT 79

PET 80

PET-CT 84

Thyroid Carcinoma 85

M. Biermann, F. Beyer, W. Heindel, O. Schober

Epidemiology and Classification 85

Ultrasound and CT 86

Multimodal Treatment and Diagnosis of DTC 88

Medullary Thyroid Carcinoma 93

Other Thyroid Malignancies 95

Malignant Tumors of the Lung and Pleura 97

F. Beyer, N. Roos, C. Franzius

Non-Small Cell Lung Cancer 97

Small-Cell Lung Cancer 113

Malignant Pleural Mesothelioma 114

Pulmonary Metastases 116

Tumors of the Upper Digestive Tract 120

B. Riemann, K. U. Juergens

Esophageal Carcinoma 120

Gastric Carcinoma 126

Pancreatic Tumors	128	Evaluating Treatment Response and Follow-Up	192
Gastrointestinal Stromal Tumors	132	Cost-Benefit Analysis	193
Tumors of the Liver and Lower Digestive Tract	135	Musculoskeletal Tumors	194
<i>B. Riemann, J. Wessling</i>		<i>C. Franzius, V. Vieth</i>	
Tumors of the Liver	135	Bone Tumors	195
Small-Bowel Carcinoma	137	Soft-Tissue Tumors	201
Colorectal Carcinoma	138	Prognosis	205
Gynecologic Tumors	140	Response to Therapy	205
<i>S. Weigel, L. Stegger, W. Heindel</i>		Detection of Recurrence	206
Breast Cancer	140	Tumors in Children	209
Tumors of the Female Pelvis	145	<i>C. Franzius, M. Schiborr</i>	
Ovarian Cancer	146	Lymphoma	209
Cervical Cancer	148	Bone Sarcomas	215
Endometrial Cancer	150	Soft-Tissue Sarcomas	221
Tumors of the Adrenal Gland, Kidney, Urinary Tract, Bladder, and Germ Cell Tumors	155	Neuroblastoma	221
<i>P. Kies, M. Puesken, W. Heindel</i>		Langerhans Cell Histiocytosis	227
Adrenal Tumors	155	Hepatoblastoma	228
Renal Cell Carcinoma	157	Other Rare Extracranial Tumors	228
Bladder Cancer	160	Brain Tumors	229
Germ Cell Tumors	162	CUP Syndrome	232
Prostatic Carcinoma	169	<i>J. Wessling, P. Matheja</i>	
<i>M. Weckesser, K. U. Juergens</i>		Diagnosis	233
CT	171	CUP Syndrome with Cervical Lymph Node Metastases	234
PET	171	CUP Syndrome with Extracervical Metastases	234
PET-CT	176	PET-CT for Radiotherapy Planning	236
Malignant Lymphoma	177	<i>S. Koenemann, N. Willich, M. Weckesser</i>	
<i>K. U. Juergens, S. Hermann</i>		Staging and Patient Selection	236
Imaging Studies	179	Target Volume and Radiotherapy Planning	236
Malignant Melanoma	187	Innovative Radiopharmaceuticals and Experimental Markers	239
<i>M. Loeffler, M. L. Oei</i>		Evaluating Treatment Response	240
Benign-Malignant Differentiation	188	Efficient Use of PET-CT	240
Staging	189	Future Outlook for Radiotherapy	240
		Summary	242

3 Inflammatory Diseases ... 247

M. Loeffler, J. Wessling

Definition and Classification	247	Vascular Graft Infections	252
Tracers for Inflammation Imaging	247	Endocarditis	253
Infectious Inflammatory Diseases	248	Noninfectious Inflammatory Diseases	254
Fever of Unknown Origin	248	Arthritis	254
Osteomyelitis	249	Granulomatous Inflammations and Vasculitis	254
Prosthetic Joint Infections	251	Chronic Inflammatory Bowel Diseases	256
		Summary	259

4 *Diagnosis of Cardiovascular Diseases ... 261*

M. Schaefers, R. Fischbach

Basic Principles of Noninvasive Cardiovascular	Cardiac CT	265
Imaging	Cardiovascular PET-CT	268
PET	Summary	270

5 *Neurodegenerative Diseases ... 271*

M. Weckesser, T.-U. Niederstadt

CT	PET-CT	279
PET	Summary	280

6 *Developments and Outlook ... 281*

O. Schober, W. Heindel

7 *Appendix ... 285*

Internet Links	Glossary	287
<i>K. H. Juergens, B. Riemann</i>	<i>H. Kugel</i>	
	Index	290