




EDITED BY

Hameed Rafiee

CHAPMAN & NAKIELNY'S



Aids to
Radiological
Differential
Diagnosis



SEVENTH EDITION



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Edinburgh London New York Oxford Philadelphia St Louis Sydney 2020

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First edition 1984
Second edition 1990
Third edition 1995
Fourth edition 2003
Fifth edition 2009
Sixth edition 2014
Seventh edition 2020

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ISBN: 978-0-7020-7539-1

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Printed in Poland

Last digit is the print number: 9 8 7 6 5 4 3 2 1



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Preface and explanatory notes

I am very fortunate to find myself in the position of editing this well-loved core radiology text, and at the same time very anxious to do the book justice to maintain its reputation. Radiology has expanded rapidly in recent years, and as such this 7th edition is the biggest revision this book has had in its long history. Nearly every section in every chapter has undergone major changes, with the addition of a new Nuclear Medicine chapter to reflect its importance in modern medical imaging. Part 2 has been restructured to focus on multisystem disorders which cannot be fully covered in individual chapters—many of these are a favourite of the long cases in the FRCR Part 2B exam. Where these multisystem disorders are listed as differentials in the various chapters of Part 1, they are denoted by an asterisk (*) to enable the reader to check Part 2 for the imaging features of the disease in other organ systems.

Important discriminating features have been added to nearly every differential to aid the reader in developing a strategy for reaching a diagnosis. Diagnoses are still listed in the approximate order of commonness, but note that this order is less clear-cut for rarer diagnoses due to less reliable epidemiological data. Also, the presence or absence of discriminating features has significant impact on the relative likelihood of the differentials. In view of this, and the large variability of data in the literature, I have reduced the amount of 'percentages' in this book. These are far less important than learning the discriminating features. Finally, the top differentials in each list which are considered most important for radiology trainees to learn are underlined. The number of diagnoses underlined varies from list to list—some of the more important lists have all of their differentials underlined, whereas other lists which are aimed at specialists may have no underlined differentials at all.

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In addition to those listed, the editors would like to acknowledge and offer grateful thanks for the input of all previous editions' contributors, without whom this new edition would not have been possible.

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Acknowledgements

This project has been a monumental task, and would not have been possible without the expertise of the 32 contributors who have worked on this with me. Special thanks go to Sami Khan for his additional invaluable assistance in the planning stage of the project and for helping me find contributors for various chapters, as well as Stuart Taylor and the publishing team at Elsevier for giving me the opportunity to take on this project in the first place. A huge thank you also goes to my fantastic colleagues at Norfolk & Norwich University Hospital, many of whom have contributed to this edition. The culture of excellent radiology education and support in our department makes it a wonderful place to train and work, and has quite literally made me the radiologist I am today. For this reason I am donating 50% of my royalties to the Norwich Radiology Academy Charitable Fund, to help train and support current and future radiology trainees at the Academy.

Lastly, and most importantly of all, I cannot thank my family enough for all of the support they've shown me throughout this project – my delightful daughters Elika and Suri, for being my *raison d'être* and for tolerating a part-time father; my wonderful wife Hoda, for being my rock and for tolerating a part-time husband whilst raising a newborn and a toddler; Hoda's amazing family, for supporting her whilst I was preoccupied; my parents Abdi & Sima, for being the best parents I could wish for and inspiring me to become a teacher and author; and my incredible brother Siam, for whom I am donating the other 50% of my royalties to the charity PSC Support.

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Abbreviations

99mTc-DMSA	Technetium-99m-2,3-dimercaptosuccinic acid
αFP	Alpha-fetoprotein
AAA	Abdominal aortic aneurysm
ABC	Aneurysmal bone cyst
ABPA	Allergic bronchopulmonary aspergillosis
ACE	Angiotensin-converting enzyme
ACTH	Adrenocorticotrophic hormone
AD	Autosomal dominant
ADC	Apparent diffusion coefficient
ADPKD	Autosomal dominant polycystic kidney disease
AIDS	Acquired immune deficiency syndrome
AKI	Acute kidney injury
AML	Angiomyolipoma
ANCA	Anti-neutrophil cytoplasmic antibody
AP	Anteroposterior
AR	Autosomal recessive
ARDS	Acute respiratory distress syndrome
ARPKD	Autosomal recessive polycystic kidney disease
ARVC	Arrhythmogenic right ventricular cardiomyopathy
ARVD	Arrhythmogenic right ventricular dysplasia
ASD	Atrial septal defect
AV	Atrioventricular
AVM	Arteriovenous malformation
AVN	Avascular necrosis
AVSD	Atrioventricular septal defect
AXR	Abdominal X-ray
BCC	Basal cell carcinoma
BFH	Benign fibrous histiocytoma
BPH	Benign prostatic hyperplasia
CADASIL	Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy
CBD	Common bile duct
CEA	Carcinoembryonic antigen
CF	Cystic fibrosis

CHD	Common hepatic duct
CJD	Creutzfeldt–Jakob disease
CMC	Carpometacarpal
CMV	Cytomegalovirus
CNS	Central nervous system
COPD	Chronic obstructive pulmonary disease
CPPD	Calcium pyrophosphate deposition disease
CRMO	Chronic recurrent multifocal osteomyelitis
CSF	Cerebrospinal fluid
CT	Computed tomography
CTA	CT angiography
CTPA	Computed tomography pulmonary angiogram
CXR	Chest X-ray
DAI	Diffuse axonal injury
DCIS	Ductal carcinoma in situ
DCM	Dilated cardiomyopathy
DIP	Distal interphalangeal
DISH	Diffuse idiopathic skeletal hyperostosis
DMSA	Dimercaptosuccinic acid
DNET	Dysembryoplastic neuroepithelial tumour
DPM	Ductal plate malformation
DVT	Deep vein thrombosis
DWI	Diffusion-weighted imaging
EBV	Epstein–Barr virus
ELISA	Enzyme-linked immunosorbent assay
EPI	Echo-planar imaging
ESR	Erythrocyte sedimentation rate
FAP	Familial adenomatous polyposis
FDG	Fluorodeoxyglucose
FIGO	International Federation of Gynecology and Obstetrics
FLAIR	Fluid-attenuated inversion recovery
FMD	Fibromuscular dysplasia
FNA	Fine needle aspiration
FNH	Focal nodular hyperplasia
GB	Gall bladder
GCSF	Granulocyte-colony stimulating factor
GCT	Giant cell tumour
GGO	Ground-glass opacification
GI	Gastrointestinal
GIST	Gastrointestinal stromal tumour

HAART	Highly active antiretroviral therapy
HCC	Hepatocellular carcinoma
hCG	Human chorionic gonadotropin
HCM	Hypertrophic cardiomyopathy
HHT	Hereditary haemorrhagic telangiectasia
HIDA	Hepatobiliary iminodiacetic acid
HIV	Human immunodeficiency virus
HOA	Hypertrophic osteoarthropathy
HPB	Hepatic pancreatic biliary
HPV	Human papillomavirus
HRCT	High-resolution computed tomography
HSP	Henoch-Schönlein purpura
HSV	Herpes simplex virus
HU	Hounsfield units
HUS	Haemolytic uremic syndrome
IBD	Inflammatory bowel disease
IHD	Ischaemic heart disease
IPF	Idiopathic pulmonary fibrosis
IPMN	Intraductal papillary mucinous neoplasm
IUD	Intrauterine device
IV	Intravenous
IVC	Inferior vena cava
IVF	In vitro fertilization
IVU	Intravenous urogram
LAM	Lymphangiomyomatosis
LBO	Large bowel obstruction
LCH	Langerhans cell histiocytosis
LGE	Late gadolinium enhancement
LIP	Lymphoid interstitial pneumonia
LV	Left ventricle
LVF	Left ventricular failure
MAC	<i>Mycobacterium avium</i> complex
MALT	Mucosa-associated lymphoid tissue
MCA	Middle cerebral artery
MCP	Metacarpophalangeal joint
MEN	Multiple endocrine neoplasia
MI	Myocardial infarction
MIBG	Meta-iodo-benzyl-guanidine
MPA	Main pulmonary artery
MPNST	Malignant peripheral nerve sheath tumour

MR	Magnetic resonance
MRA	MR angiography
MRCPP	Magnetic resonance cholangiopancreatography
MRI	Magnetic resonance imaging
MS	Multiple sclerosis
MTPJ	Metatarsophalangeal joint
NAI	Nonaccidental injury
NEC	Necrotizing enterocolitis
NET	Neuroendocrine tumour
NF	Neurofibromatosis
NHL	Non-Hodgkin lymphoma
NICE	National Institute for Health and Clinical Excellence
NM	Nuclear medicine
NMO	Neuromyelitis optica
NOF	Nonossifying fibroma
NRH	Nodular regenerative hyperplasia
NSAID	Nonsteroidal antiinflammatory drug
NSIP	Nonspecific interstitial pneumonia
OCP	Oral contraceptive pill
OPG	Orthopantomogram
PA	Posteroanterior
PAN	Polyarteritis nodosa
PAS	Periodic acid–Schiff (stain)
PBC	Primary biliary cholangitis
PCP	<i>Pneumocystis carinii</i> pneumonia
PD	Pancreatic duct
PDA	Patent ductus arteriosus
PE	Pulmonary embolism
PEEP	Positive end-expiratory pressure
PET	Positron emission tomography
PID	Pelvic inflammatory disease
PIP	Proximal interphalangeal
PKD	Polycystic kidney disease
PMF	Progressive massive fibrosis
PNET	Primitive neuroectodermal tumour
POEMS	Polyneuropathy, organomegaly, endocrinopathy, monoclonal gammopathy, skin changes
PRES	Posterior reversible encephalopathy syndrome
PSC	Primary sclerosing cholangitis
PSV	Peak systolic velocity

PTLD	Posttransplant lymphoproliferative disorder
PUJ	Pelviureteric junction
PV	Portal vein
PVNS	Pigmented villonodular synovitis
RCC	Renal cell carcinoma
RFA	Radiofrequency ablation
RPF	Retroperitoneal fibrosis
RTA	Road traffic accident
RV	Right ventricle
SAH	Subarachnoid haemorrhage
SAM	Segmental arterial mediolysis
SAPHO	Synovitis, acne, pustulosis, hyperostosis, osteitis
SBC	Simple bone cyst
SBO	Small bowel obstruction
SCC	Squamous cell carcinomas
SCD	Sickle cell disease
SDH	Subdural haemorrhage
SIJ	Sacroiliac joint
SLE	Systemic lupus erythematosus
SMA	Superior mesenteric artery
SMV	Superior mesenteric vein
SPECT	Single-photon emission computed tomography
STI	Sexually transmitted infection
STIR	Short tau inversion recovery
SUFE	Slipped upper femoral epiphysis
SVC	Superior vena cava
SWI	Susceptibility weighted imaging
TACE	Transarterial chemoembolization
TAPVD	Total anomalous pulmonary venous drainage
TB	Tuberculosis
TCC	Transitional cell carcinoma
TE	Echo time or time to echo
TFCC	Triangular fibrocartilage complex
TGA	Transposition of the great arteries
TI	Terminal ileum
TORCH	Toxoplasmosis, other infections, rubella, cytomegalovirus, herpes simplex
TURP	Transurethral resection of prostate
UC	Ulcerative colitis
UIP	Usual interstitial pneumonia

URTI	Upper respiratory tract infection
US	Ultrasound
UTI	Urinary tract infection
vHL	von Hippel Lindau
VSD	Ventricular septal defect
VUJ	Vesicoureteric junction
VUR	Vesicoureteric reflux
VZV	Varicella-Zoster virus
XD	X-linked dominant
XGP	Xanthogranulomatous pyelonephritis
XR	X-linked recessive

Part



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Bones

Bhavin Upadhyay, Sajid Butt, Syed Babar Ajaz,
Andoni Toms, James MacKay

1.1 GENERALIZED INCREASED BONE DENSITY IN AN ADULT

Most common

1. **Metastases**—prostate and breast most common. Heterogeneous; generally not diffuse.
2. **Sickle cell disease**—medullary sclerosis and bone infarcts. Growth arrest of long bones. H-shaped vertebrae.
3. **Myelofibrosis**—older patients. Diffuse medullary sclerosis, loss of corticomedullary differentiation. No heterogeneity.

Less common

4. **Renal osteodystrophy**—axial > appendicular. Rugger jersey spine.
5. **Osteopetrosis**—thickened cortices with reduced marrow space. Pathological transverse fractures.
6. **Paget's disease**—coarse trabeculae and bone expansion. Multiple bones rather than generalized.
7. **Systemic mastocytosis**—lytic, sclerotic or mixed. Usually diffuse affecting spine and epiphyses of long bones.

Rare

8. **Fluorosis**—diffuse osteosclerosis, particularly ribs and spine, with enthesal ossification.
9. **Pyknodysostosis**—narrow medullary cavities with multiple long bone fractures.
10. **Hypoparathyroidism**—diffuse sclerosis in 10%. Dense metaphyseal bands and skull vault thickening.
11. **Progressive diaphyseal dysplasia (Camurati-Engelmann disease)**—young patients. Fusiform enlargement and sclerosis of long bones sparing the epiphyses.
12. **Myeloma**—rare osteosclerosing form. Associated with POEMS syndrome.

1.2 SOLITARY SCLEROTIC BONE LESION

Most common

1. **Bone island (enostosis)**—ovoid with long axis parallel to long axis of bone and a feathered border.
2. **Enchondroma**—confluent punctate or nodular calcification, denser centrally than peripherally. Enchondromas in the large long bones are often more calcified than those in the fingers.
3. **Metastasis**—prostate, breast, mucinous adenocarcinoma of GI tract, carcinoid, lymphoma, TCC in adults. Medulloblastoma and neuroblastoma in children.
4. **Callus**—usually associated with a fusiform swelling in long bones.
5. **Bone infarct**—usually a central metadiaphyseal lucency with thin serpentine calcified margins.

Less common

6. **Paget's disease**—blastic phase causes sclerosis accompanied by bone expansion, and cortical and trabecular thickening.
7. **Osteoma**—arises from membranous bone: skull and paranasal sinuses. Ivory osteomas contain no trabeculae. Mature osteomas have visible marrow. If multiple consider Gardner syndrome.
8. **Osteoid osteoma/osteoblastoma**—sclerosis caused by eccentric periosteal thickening. Osteoid osteoma: radiolucent nidus <2 cm. Osteoblastoma: more common in the posterior elements of spine, larger nidus with thin shell.
9. **Healed or healing bone lesion**—treated metastasis, NOF, simple bone cyst, brown tumour, eosinophilic granuloma.
10. **Primary bone sarcoma**—aggressive features: poorly defined margins, aggressive periosteal reaction, Codman's triangles, bone destruction, soft tissue mass.
11. **Fibrous dysplasia**—usually lytic with ground glass areas but can calcify in later life.
12. **Chronic osteomyelitis**—usually associated with an area of lysis, chronic periosteal reaction and occasionally a sequestrum.
13. **Chronic recurrent multifocal osteomyelitis (CRMO)**—idiopathic inflammatory disorder. Most commonly affects clavicles and tibias in children. Often multifocal.
14. **Lymphoma**—primary bone lymphoma rare. More common as secondary involvement. Large extraosseous soft tissue mass with relative preservation of bone.
15. **Cement and bone graft substitutes**—history of surgery.